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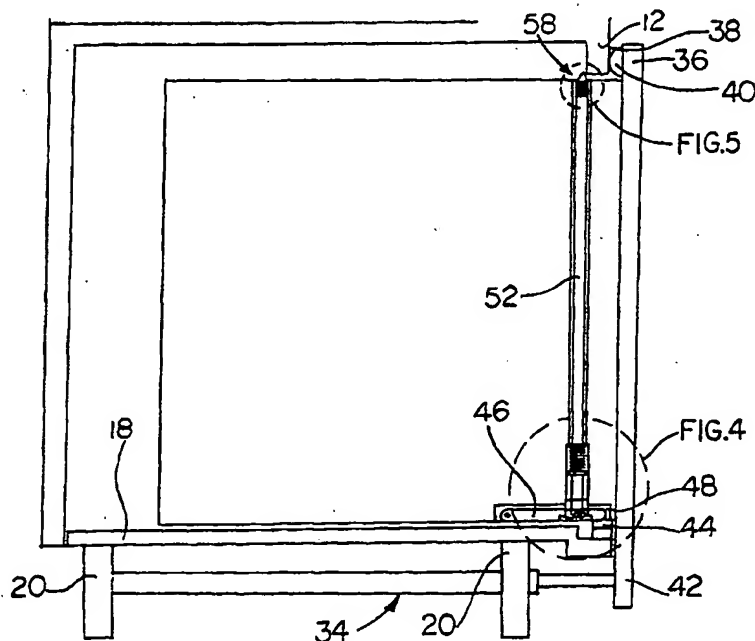
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(54) Title: LATCHING MECHANISM FOR LATCHING A SLIDE OUT ROOM TO MAIN LIVING AREA

(57) Abstract

A mobile living quarter incorporates a slide out room which is moveable between an extended position providing an auxiliary living area when the unit is parked but which is retracted into the main living area when the unit is moved. A latching mechanism automatically latches the slide out room to the main living area as the slide out room is moved into the fully retracted position, and releases the latch (50) to permit outward movement of the slide out room when the unit is parked and the slide out room is extended.



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LATCHING MECHANISM FOR LATCHING A SLIDE OUT ROOM TO MAIN LIVING AREA

This invention relates to a latching mechanism for latching a slide out room of mobile living quarters (such as a recreational vehicle) to the main living area when the slide out room is retracted into the main living area.

The width of mobile living quarters, such as recreational vehicles, manufactured housing and the like, is limited to that which may be accommodated for travel on the public highways. Accordingly, when the mobile living quarters is parked for use, it is desirable to be able to expand the living quarters to increase the available living area. Accordingly, so called slide out rooms have become popular. These slide out rooms are retracted into the main living area when the mobile living quarters are transported on the public highways, but are extended from the main living area to provide additional living space when the mobile living quarters is parked for use. Slide out rooms are normally supported on telescoping tubes which are mounted on the frame supporting the main living area and are operated by hydraulic rams. Necessary sealing is provided to seal the slide out room in both the retracted and extended positions. However, the slide out room is only semi-rigid, and portions of the room furthest from the hydraulic rams are not sufficiently rigid that engagement with the seals can be assured. Hydraulic rams and the support mechanisms of slide out rooms can be adjusted so that the portions of the room closest to the hydraulic rams, which is the portion of the room closest to the frame and floor, are maintained against the seals when the room is retracted, but the portion of the room furthest away from the rams, such as that portion of the room adjacent the ceiling, may deflect sufficiently that the seals are not engaged. Accordingly, it has become customary to use so called "travel locks" to latch and maintain the top of the slide out room in a position in which the slide out room is engaged with and sealed against the main living area all around the slide out room. Unfortunately, these travel locks are difficult to install and remove and, must be installed and removed manually.

The present invention provides a latching mechanism for a slide out room that includes a latch which latches the slide out room to the main living area so that the ceiling is engaged with the slide out room, thereby preventing entry of moisture or other environmental elements.

The latch is operated by an actuator which is responsive to relative movement between the slide out room and the main living area to engage the latch as the slide out room reaches the fully retracted position and to disengage the latch as the slide out room begins to move away from the fully retracted position. In this way, the slide out room is automatically latched to the main living area when the slide out room is retracted for travel and is automatically unlatched as the room is extended for use.

These and other advantages of the present invention will become apparent from the following description, with reference to the accompanying drawings, in which:

Figure 1 is a view in perspective of a mobile living quarters with a slide out room partially extended from the main living area;

Figure 2 is a cross-sectional view taken through mobile living quarters illustrating the slide out room retracted into the main living area and further including the latching mechanism made pursuant to one embodiment of the present invention;

Figure 3 is an enlarged view of the lower circumscribed portion of Figure 2, but illustrating the actuator forming a component of the latching mechanism in the released position permitting extension of the retractable room;

Figure 4 is a view similar to Figure 3, but illustrating the latching mechanism in the actuated or latched position;

Figures 5 and 6 are detailed views of the upper circumscribed portion of Figure 3 illustrating components of the latching mechanism which allows deflection of the latch to accommodate travel by the retractable room from the fully retracted position;

Figure 7 is a fragmentary cross-sectional view taken parallel to the floor of the mobile living quarters and illustrating a latching mechanism made pursuant to another embodiment of the present invention, the latching mechanism being illustrated in the latched position;

Figure 8 is an enlarged view of the circumscribed portion of Figure 7;

Figure 9 is a view similar to Figure 7, but illustrating the mechanism in the unlatched position and the slide out room being extended from the main living quarters;

Figure 10 is a view in perspective of a slide out room extended from main living quarters and incorporating the latching mechanism of Figures 7-9;

Figure 11 is a view in perspective of the latching mechanism used in the slide out room illustrated in Figure 18, the latching mechanism being illustrated in the latched condition;

Figure 12 is a view similar to Figure 11 but illustrating in the latching mechanism in the released condition;

Figure 13 is a fragmentary, transverse cross sectional view taken through mobile living quarters incorporating a slide out room and illustrating a latching mechanism made pursuant to still another embodiment of the present invention, the latching mechanism being illustrated in the release position permitting movement of the slide out room relative to the main living quarters;

Figure 14 is a view similar to Figure 13 but illustrating the latch mechanism in the latched or locked position;

Figure 15 is a detailed view and perspective of the circumscribed portion of Figure 13;

Figure 16 is a view similar to view 15, but illustrating the components thereof in their actuated position when the slide out room is in the fully retracted position;

Figures 17 and 18 are views similar to Figures 15 and 16 respectively, but illustrating the different embodiment of the actuation mechanism illustrated in Figures 15 and 16;

Figures 19 and 20 are views similar to Figures 15 and 16 respectively, but illustrating still another embodiment of the actuation mechanism illustrated in Figures 15 and 16.

Figure 21 is a fragmentary view in perspective of a mobile living quarters incorporating the latching mechanism illustrated in Figures 13 and 14 with the slide out room extended from the main living area;

Figure 22 is a view similar to Figure 15 but illustrating the slide out room retracted into the main living quarters and illustrating the latching mechanism engaged to latch the slide out room in place;

Figure 23 is a fragmentary view in perspective of a mobile living quarter with a slide out room partially extended from the main living area illustrates another embodiment of the invention;

Figure 24 is a fragmentary cross sectional view taken substantially along lines 23-23 of Figure 46;

Figure 25 is a view similar to Figure 24, but illustrating the various components of the latching mechanisms and their positions when the retractable room is fully retracted into the mobile living quarter and the upper portion of the room is latched to the main living quarters;

Figures 26 and 27 are views similar to Figures 34 and 35, but illustrating still another alternate embodiment of the invention;

Figure 28 is a view similar to Figure 52, but illustrating still another embodiment of the invention; and

Figure 29 is an enlarged, fragmentary, cross sectional view taken substantially along lines 29-29 of Figure 28;

Figure 30 is a view in perspective of a mobile living quarters with a slide out room fully extended from the main living area and incorporating a latching mechanism pursuant to still another embodiment of the present invention tucked in the corner between the side wall of the slide out room and the fascia extending from the front wall of the slide out room;

Figure 31 is an enlarged view in perspective of the corner between the side wall of the slide out room and the front wall of the slide out room illustrated in Figure 25 and illustrating details of the latching mechanisms;

Figure 32 is a fragmentary view taken from above with respect to Figures 25 and 26, but illustrating the positions of the various components of the latching mechanism just before the slide out room is retracted to the fully retracted position; and

Figure 33 is a view similar to Figure 32, but illustrating the various components of the latching mechanism of Figures 25-27 when the slide out room is in the fully retracted position.

This application discloses multiple embodiments. Elements the same or similar to elements in each of the embodiments retain the same reference character.

Referring now to the drawings, mobile living quarters generally indicated by the numeral 10 is defined a side wall 12, end walls 14, and a ceiling or upper wall 16, and a floor 18. Mobile living quarters 10 is supported on longitudinally extending, transversely spaced frame members 20. One of the walls 12 is provided with an aperture 22 for receiving the slide out room generally indicated by the numeral 24 which can be extended from the main living quarters 10 to provide auxiliary living space when the unit is parked for use, but which

may be retracted into the main living quarters 10 through the aperture 22 when the unit is to be moved. The wall 12 includes a header 23 extending across the aperture 22.

The slide out room 24 includes front wall 26, ceiling 28, floor 30 and opposite side walls 32. The slide out room 24 is supported for movement between the extended and retracted positions by telescoping support tubes generally indicated by the numeral 34. Hydraulic rams (not shown) of conventional design, are provided to move the slide out room between the extended and retracted positions. The front wall 26 includes a projection portion or fascia 36 that projects beyond the ceiling 28 and the side walls 32. A conventional seal 38 is compressed between the fascia 36 and a corresponding sealing surface 40 on the wall 12 to effect a seal between the slide out room 24 and the main living quarters 10 when the slide out room is moved into the retracted position.

The support tubes 34 may be equipped with a tilting mechanism. This tilting mechanism pivots the slide out room 24 relative to the main living area a very small amount as the slide out room is moved into the fully retracted position. This pivoting is just sufficient to assure that the seal 38 is compressed between the fascia 36 and that portion of the wall 12 adjacent the aperture 22. The aforementioned hydraulic rams (not shown) and the support tubes 34 are secured to the portion 42 of the front wall 26 that projects below the floor 30 of the slide out room 24. The floor 30 of the slide out room is partially supported on a wear bar 44 that extends across the lower side of opening 22 as the slide out room is extended and retracted.

Since the support tubes 34 and the hydraulic rams (not shown) which support and operate the slide out room 24 are attached to the lower portion 42 of the wall 26, complete retraction of the lower portion of the slide out room 24 can be assured. However, since the slide out room cannot be made totally rigid, and because of inherent deflection of the room, portions of the room that are further away from the actuators may not fully close against the seal 38 and the sealing portion 40 of the wall 22 thereby permitting rain, snow, and other environmental elements to enter the living areas of the unit. Accordingly, it has become common to provide a manually installed travel lock adjacent the ceiling 28 of the slide out room to clamp the upper portion of the fascia 36 against the seal 38 and the sealing surface 40.

This conventional travel lock must be installed and removed each time that the unit is transported and since installation and removal must be done manually, it often is difficult and inconvenient for the user to install a conventional travel lock. According to the present invention, an automatic travel lock is provided which automatically engages to assure proper positioning of the slide out room 24 whenever the slide out room is moved from the extended position to the retracted position in preparation for transporting. The travel lock is automatically released when the room is moved from the retracted position to the extended position.

Referring now to Figures 2-6, one embodiment of the invention includes a lever 46 which is received within a compartment 48 defined within side wall 32 of the slide out room 24. Lever 46 is pivotally connected to the side wall 32 by a pivot 50 extending through one end of the lever 46, and an actuating link 52 is pivotally connected by pivot pin 54 in slotted aperture 56 of the lever 46. The link 52 extends upwardly, preferably within the corresponding side wall 32 and terminates in a latch generally indicated by the numeral 58 at the end of the link 52 opposite the end attached to the lever 46. The link extends through the wall 32 offset from the fascia 36 a distance substantially equal to the thickness of the wall 12 and the seal 38. Latching member 58 includes a curved surface 60 defined on a member 62 which is pivotally mounted by pivot 64 on a caging member 66 slidably mounted on the link 52 and urged upwardly relative to the link 52 toward a stop (not shown) extending from the link 52 by a spring 68. The latch 58 is illustrated in a position in which it is fully extended from the link. The cage 66 is biased into engagement with the aforementioned stop (not shown). In Figure 6, the cage 66 is illustrated in a lowered position. Accordingly, it will be noted that as the slide out room 24 is withdrawn from the extended position to the retracted position, the latch member 62 will be flexed about the pivot 64 and the spring 68 will compress to allow the latching 58 to move past the wall 12, whereupon the spring 68 will bias the member 62 such that a point on the curved surface 60 will engage the inner surface of the wall 12, thus locking the upper portion of the slide out room 24 in place.

The end of the link 52 attached to the lever 46 extends through a caging member 70 which is mounted in the lower portion of the wall 32 and extends through the cavity 48. A

spring 72 is disposed between the end of the caging member 70 and a shoulder 74 on the link 52, thereby biasing the link 52 downwardly viewing the Figures. As the link 52 is biased downwardly, it will be seen that (viewing Figures 2-4), when the slide out room 24 is in the fully retracted position, the end of the lever 46 adjacent the pivot 54 will engage the wear bar 44 or other surface on the main living area thus maintaining the link 52 in its upward most position, allowing the latch 62 to engage the wall 12 and lock the slide out room 24 in the retracted position.

As discussed above, the actuators which move the slide out room 24 between the extended and retracted positions are engaged with the lower portion 42 of the outer wall 26, the slide out room 24 is only semi-rigid, and the portions of the room adjacent the upper portion of the walls 32, 26 can deflect relative to the lower portion as the slide out room is moved. When the slide out room is extended from the retracted position, the upper portion of the room remains locked in place by latching mechanism 58 while the lower portion is moved by the aforementioned actuators in an amount sufficient to allow the lever 46 to pass beyond the wear bar 44. When this occurs, the lever 46 drops from the Figure 4 position to the Figure 3 position, thereby also moving the link 52 downwardly viewing the Figures an amount sufficient to withdraw the latching mechanism 58 sufficiently that the latch can pass beneath the lower edge of the wall 12 defining the upper edge of the aperture 22. It will be noted that, when the room is retracted, even though the lower portion of the room will reach the fully retracted position first causing the lever 46 to be moved in its upward position illustrated in Figure 4, that the latching mechanism 58 will still pass below the wall 12 due to the pivot connection between the member 62, 64, and because the spring 68 allows the entire latching assembly 58 to deflect.

Referring now to the embodiment of Figures 7-12, the latching mechanism 168, according to another embodiment of the invention includes a base plate 170 which is secured to a corresponding side wall 32, and is tucked behind the fascia 36. Since the latching mechanisms 168 mounted on the side walls 32 on opposite sides of the slide out room 24 (Figure 27) are substantially identical, only one of the latching mechanisms 168 will be described in detail. Latching mechanism 168 includes a vertically extending shaft 172 which is

mounted for rotation relative to the base plate 170 by appropriate fasteners (not shown). An actuator or paddle 174 is secured for rotation with the shaft 172, and paddle 174 carries a resilient sleeve 176 on the lower end thereof, viewing Figures 11 and 12. The opposite end of the shaft 172 is received in an axially extending recess (not shown) of a larger diameter stub shaft 178. A coiled clutch spring 180 interconnects the shafts 172 and 178 such that at relative torques below a predetermined level the stub shaft 178 turns with the shaft 172, but when the relative torques between stub shaft 178 and shaft 172 exceed the predetermined level, the shaft 172 is allowed to rotate relative to the shaft 178.

Latching mechanism 168 further includes a latch member generally indicated by the numeral 182, which includes a pair of arms 184, 186. The arm 186 is pivotally connected to the arm 184 by a hinge 187 which pivots about pivot hinge pin 188. It will be noted that the diameter of the pin 188 is substantially less than the diameter of the stub shaft 178. A resilient sleeve 190 is received on the end of the arm 186. A reinforced fibrous web or similarly flexible material generally indicated by the numeral 192 is attached at one end to the stub shaft 178 by fasteners 194 and is threaded through a slot 196 defined between the arm 184 and a cover member 198 attached thereto. The web may be cotton or nylon reinforced webbing of the same general type used for seat belts or cargo tie-downs. The web 192 extends around the hinge 187 and is attached to the arm 186 by fasteners 200.

In operation, the various components of the latching mechanisms 168 are illustrated in Figure 11 in the positions which they assume when the slide out room 24 is in the extended position and are illustrated in Figure 12 in the positions which they assume when the slide out room is retracted into the main living area, as illustrated in Figure 9. Referring to Figures 8 and 11, as the slide out room 24 is retracted into the main living area, the seal 136 wipes across the wall 132 and, when the room has been retracted sufficiently, wipes across the sleeve 190, the hinge 187 and onto the cover plate 198. As the slide out room 24 moves toward the retracted position, the actuator or paddle 174 engages the wall 12. Further movement of the slide out room toward the retracted position causes the actuator 174 to rotate the shaft 172 in the direction indicated by the arrow A on the Figure 11. As this occurs, because of the driving connection between the shaft 172 and the shaft 178 provided by clutch

spring 180, the stub shaft 178 will also rotate in the direction of arrow A, thereby winding the webbing 192 around the stub shaft 178. As the webbing is being wound, the arm 186 will pivot relative to the arm 184 about the hinge 187. Accordingly, the arm 186 will be pivoted from its substantially flat orientation illustrated in Figures 27 and 30 to its articulated orientation, illustrated in Figures 9, 10 and 12. In the articulated orientation, the sleeve 190 is engaged with the wall 12. It will be noted that, because of the difference in diameters between stub shaft 178 and hinge pin 188, the arm 186 will be rotated at a proportionately greater angle compared with the actuator 174. Accordingly, the sleeve 190 will be forced into engagement with the inner side of the wall 12 regardless of the thickness of the wall 12 (within limits). The latching mechanism 168 can be used on mobile living quarters made by different manufacturers, which may use walls of different thicknesses. It will also be noted that, after the sleeve 190 has engaged the wall 12 and is applying pressure thereto, and when the torque from the shaft 172 to the shaft 178 exceeds a predetermined torque level, the shaft 172 will slip relative to stub shaft 178. When the slide out room is moved away from the retracted position toward the extended position, as the actuator 174 is moved away from the outside of the wall 12 the clutch spring 180 rotates the shaft to a position returning the actuator 174 from the position illustrated in Figure 12 to the position illustrated in Figure 11, and also causing the stub shaft 178 to unwind the webbing 192, thereby permitting the arm 186 to move back into the position illustrated in Figure 11.

Referring now to the embodiments of Figures 13-22, a latching mechanism according to another embodiment of the invention is generally indicated by the numeral 402 and is mounted on the side walls 32 of the slide out room 24. The latching mechanisms 402 include a lever 404 which is mounted on the side of the corresponding wall 32 adjacent the end thereof which joins with the ceiling 28. The lever 404 is mounted for movement relative to a fixed pivot 406 which mounts the lever 404 onto the side wall 32. The lever 404 is adapted to rotate about pivot 406 to move end 408 of the lever 404 to permit the end 408 to engage a header plate 412 mounted on the wall 12 of main living quarters 10 to thereby latch the slide out room 24 in place when the slide out room 24 is moved into the retracted position, a gap 410 is defined between the walls 32 of slide out room 24 and the edges of the aperture 22 to

accommodate the latching mechanism 402. The gap 410 is covered by fascia (not shown in Figs. 13-16) when the room is fully retracted as will hereinafter be described.

A cable 414 is attached by pivot 416 adjacent the end of lever 404 opposite the end 408. The cable 414 extends downwardly from lever 404 and wraps around a pulley 418 and is joined to the wall 32 as at 420. Pulley 418 is mounted on a carriage 422 which is guided for movement in a substantially horizontal direction by a slot 424 in bracket 425. A tab 426 projects outwardly from the carriage and outwardly from the wall 32 so that the tab 426 can engage an area 428 on the wall 12 adjacent the aperture 22. Of course, the latching mechanism 402 mounted on the opposite wall 32 is symmetrical. A spring 428 yieldably urges carriage toward the Figure 15 position.

In operation, as the slide out room 24 is moved from the fully extended position illustrated in Figure 21 to the fully retracted position illustrated in Figure 22, the tab 426 engages the area 428 on the wall 12 of main living quarters 10. Further inward movement of the slide out room 24 causes the tab 426 to move the carriage 422, and therefore the pulley 418, from the Figure 15 position to the Figure 16 position. As the pulley moves toward the Figure 16 position, the cable 414 is pulled downwardly by the pulley, thereby rotating the lever 404 about the pivot 406 so that, as the room 24 is moved into the fully retracted position, the end 408 of the lever 404 extends to engage the header plate 412, thereby locking the slide out room in the fully retracted position. When the room is to be extended after the vehicle is parked, as described above, the hydraulic rams (not shown in Figures 13-16), which are secured to the slide out room adjacent the floor 30 thereof are operated. Accordingly, as the room is extended, movement of the room relative to the wall 12 forces the lever 404 to pivot downwardly about the pivot 406, this being allowed by slackening of the cable 414 as the tab 426 moves away from area 428 by action of spring 428. Accordingly, initial movement of the slide out room 24 away from the fully retracted position causes the crescent shaped lever 404 to pivot downwardly into the position illustrated in Figure 13, allowing it to pass beneath that portion of the wall 12 extending across the ceiling 28 of the slide out room 24.

The embodiment of Figures 14 and 17 is similar to the embodiment of Figures 11 and 15 in that pulley 418 is mounted on carriage 422 which is moved from the Figure 17 to the

Figure 18 position by engagement of the tab 426 with the wall 22 upon movement of the slide out room into the retracted position. Upon movement of the slide out room away from the retracted position, spring 428 returns the carriage 422 to the position illustrated in Figure 17 upon slackening of the cable 414. In addition to pulley 418, the cable 414 is wrapped around pulleys 430 and 432 to provide a force multiplier effect. The enlarged end 420 of the cable 414 is received within a keyhole slot 434 in a fastening fixture 436 which is mounted on support 425 and is adjustable relative thereto due to a fastener 438 which is received in elongated slot 440 and another fastener 442 which may be secured in either of three collinear openings 444a, 444b or 444c. Accordingly, the effective length of the cable 414 may be adjusted as necessary by moving the bracket 436 to engage the fastener 442 a different one of the openings 444a, 444b, or 444c.

Referring now to the embodiment of Figures 19 and 20, a lever 450 is pivotably mounted on plate 425 by a pivot connection 452. Tab 454 projects from downwardly extending arm 456 of lever 450, and enlarged end 420 of the cable 414 is received in a slot in laterally extending arm 458 of lever 450. Cable 414 is wrapped around pulley 460. A spring 462 hinges the lever 450 in the counter clockwise direction about the pivot 452 by engagement of the tab 454 with the side wall 22. Rotation of the lever in the clockwise direction from the Figure 19 position toward the Figure 20 position pulls on cable 414 to operate the lever 404 as described above. When the slide out room is moved away from the fully retracted position, the cable 414 slackens, thereby permitting the spring 428 to return the lever 456 into the Figure 48 position.

Referring now to the embodiment of Figures 23-25, a latching mechanism according to still another embodiment of the invention is generally indicated by the numeral 510 and is located in the uppermost portion of each of the side walls 32 of the retractable room 24 adjacent the ceiling 28. Latching mechanism 510 includes a pair of arcuate shaped arms 512, 514 interconnected by a bridge portion 516 having an arcuate portions 518, 524 on the outer surface thereof. A pivot 520 pivotally connects the latching mechanism 510 to wall 32 at the upper edge of the latter such that the arms 512, 514 are able to pivot to and from positions extending from the recess 522 and above the upper edge of the wall 32. A seal 40 extends

from the fascia 36 of the outer wall 26 of the slide out room 24. The arcuate surface 524 has a radius of curvature which is larger than the radius of curvature of the arcuate surface 518; accordingly, a shallower cavity is defined by the arcuate surface 524 and a deeper cavity is defined by the arcuate surface 518. Both the arcuate surface 518 and the arcuate surface 524 are adapted to engage an arcuate surface 526 defined on a detenting member 528 which is pivotally connected to the walls of the recess 522 by a pivot 530. A spring 532 urges the detenting member 528 in a clockwise direction about the pivot 530, urging the curved surface 526 of the detent member 528 into an engagement even with either the arcuate surface of 518 or the arcuate surface 524 as will hereinafter be explained.

In operation, and referring to Figures 24 and 25, as the slide out room 24 approaches the fully retracted position, the arm 512 engages outer surface 534 of header portion 536 of the wall 12 that extends across the ceiling 28 of the slide out room 24. As the slide out room 24 is further retracted, forces urging the latching mechanism 510 in the clockwise direction about the pivot 520 eventually become greater than the force resisting rotation of the latching mechanism exerted by spring 532 through detent member 528 and arcuate surface 526. Accordingly, latching mechanism 510 "snaps" from the position illustrated in Figure 53 in which the arcuate surface 524 is engaged with the arcuate surface 526, to the position illustrated in Figure 25, in which the arcuate surface 518 is engaged with the surface 526, thereby engaging the arm of 514 with the pad 538 on the side of the header 536 opposite the surface 534. It will be noted that since the arcuate surface 524 defines a shallower cavity and the surface 518 defines a deeper cavity, the force required to snap the latching mechanism 510 from the Figure 24 position to the Figure 25 position is less than the force required to return the latching mechanism 510 to the Figure 24 position. When the latching mechanism 510 is in the latched position illustrated in Figure 25, the seal 40 is sealingly engaged the surface of 534. When the unit is parked and the slide out room is to be extended, outward movement of the slide out room returns the latching mechanism 510 from the Figure 25 position to the Figure 24 position.

As discussed above, the force required to return the latching mechanism 510 to the Figure 24 position is less than the force required to "snap" the latching mechanism 510 to the

Figure 25 position. Accordingly, a substantially greater force is exerted on the pad 538 to hold the upper portion of the slide out room in place when the unit is moved. The slide out room 24 deflects or tilts when the slide out room is operated, but the tilting of slide out room 24 is minimized when the room is in the fully retracted position, since the floor 30 of the slide out room is then fully supported on the floor of the main living quarters. Accordingly, upon initial outward movement of the slide out room 24 from the fully retracted position, the forces of the aforementioned rams used to operate the room is transferred to the upper portion of the walls 32 with very little deflection thereof, making available the greater force required to move the latching mechanism 510 from the Figure 25 to the Figure 24 position available. However, as the room is retracted, the floor 30 of the slide out room is only partially supported on the floor of the main living quarters, thereby permitting the upper portion of the room 24 to tilt away from the main living quarters so that the rams below the floor 32 may not fully retract the upper portions of the room 24. Accordingly, it is desirable that a lower force be required to latch the slide out room in place as the latter is retracted. This lower force is provided by the shallower cavity defined by the arcuate surface 524 as opposed to the deeper cavity defined by the arcuate surface 518. Since the latching mechanism 510 "snaps" over center, the latching mechanism draws the upper portion of the room 24 against the main living quarters.

Referring now to the embodiment of Figures 26 and 27, a latching mechanism generally indicated by the numeral 540 includes a cylindrical recess 542 in the upper edge 544 of the side walls 32. The latching mechanism 540 further includes a solenoid coil 546 mounted in a recess in the lower edge 548 of the header 536. A plunger 550 is received within the coil 546 and is urged downwardly with respect thereto by spring 552. The end of the plunger 550 that is received within the aperture 542 has a tapered edge 554 so that the plunger 550 can "find" the aperture 542 if the plunger is not precisely aligned with the aperture. In operation, the plunger 550 is urged into sliding engagement with the upper surface 544 by the spring 552 as the slide out room 24 is retracted towards the fully retracted position. When the slide out room reaches the fully retracted position, the cylindrical aperture 542 is brought into substantial registry with the plunger 550 so that the spring 552 urges the plunger 550 into the aperture 542. Slight misalignments will be accommodated by the tapered edge 554. The

solenoid 546 is actuated automatically when power is supplied to the aforementioned rams when the room is to be extended, thus actuating the solenoid 546 to withdraw the plunger 550 against the force of the spring 552 out of the aperture 542 to permit outward movement of the slide out room 24.

Referring now to the embodiment of Figures 28 and 29, latching mechanisms 560 are installed in that portion of the wall 12 adjacent the opening 562 therein through which the slide out room 24 extends and retracts and which is engaged by the portion of the outer wall 26 of the slide out room 24 when the room is fully retracted. The latching mechanism 560 includes a bi-directional electric motor 564 from which a threaded member 566 extends. The motor 564 is capable of rotating the threaded member 566 in both clockwise and counterclockwise directions. The threaded member 566 is adapted to threadingly engage a nut 568 which is mounted on that portion of the wall 26 which registers with the latching mechanism 560. Although the nut 568 is shown as being rigidly attached to the wall 26, it may be desirable to "float" the nut to permit limited movement of the nut relative to the wall 26, in a manner well known to those skilled in the art. The threaded member 566 is provided with a pointed end 570 which assists in orienting the threaded member 566 with the nut 568 as the wall 26 is moved into initial engagement with the threaded member 566 as the slide out room is retracted. The motor 564 is controlled by a three way switch (not shown) that controls the rams that extend and retract the room 24. When this switch is operated to extend the room 24, motor 564 is operated in a direction withdrawing threaded member 566 from nut 568, and when the room is retracted, member 566 is rotated in a direction advancing into the nut 568. Motor 564 is also controlled by a stop which generally indicated by the numeral 572 which includes a switch arm 574 which is movable in response to a spring loaded plunger 580 to move the switch arm 574 to the off position, thereby interrupting power to motor 564 when the room is fully retracted. Until interrupted by the switch 572, the motor 564 operates continuously while the slide out room is extended and retracted even if the threaded member is disengaged from nut 568.

In operation, as the aforementioned rams urge the slide out room 24 toward the retracted position, the wall 26 of a slide out room will reach a position before it reaches the

fully retracted position in which the threaded member 566 engages the nut 568 on the wall 26. The pointed end 570 assists in permitting the threaded member 566 to "find" the nut 568. As the slide out room 24 is further retracted after initial engagement of the threaded member 566 with nut 568, the threaded member 566 and nut 568 assists in maintaining alignment of the slide out room 24 with the opening to assure proper operation of the mechanism. Eventually, the wall 26 will engage the plunger 580 to compress spring 582 and thereby permit the plunger to operate the switch arm 574 to the off position. Ideally, the plunger 580 is set so that the seal 40 is compressed slightly.

When the room is to be extended, actuation of the mechanism which operates the hydraulic rams (not shown) causes the electric motor 564 to turn the threaded member 566 in a direction advancing the nut 568 toward the pointed end 570 of the threaded member 566. Of course, the nut 568 will eventually be advanced off of the threaded member 566 when the slide out room 24 moves a very short distance toward the extended position. The aforementioned rams then extend the slide out room 24 to the fully extended position, while the electric motor 564 may be left to rotate the threaded member 566 even after the nut 568 has passed off of the end of the threaded member, and is shut off automatically when the mechanism extending the room is shut off.

Referring now to the embodiment of Figures 30-33, latching mechanism generally indicated by the numeral 600 includes a rod 602 which is rotatably supported in the corner of 130 by brackets 604, 606. A latching member 608 carries a tip of resilient material 610 and extends along the rod 602 for substantially the entire height of the wall 32. A bracket 612 is mounted on the wall 26 just below the corner 130 and rotatably supports a cylinder 614 having gear teeth 616 provided on its inner diameter. A tab 620 is integral with the outer circumferential surface 618 of the cylinder 614 and carries a pad 622 on its outer edge thereof for engagement with the wall 12 as will hereinafter be described.

The lower end of the rod 602 is received within the cylinder 614 and is provided with circumferentially spaced gear teeth 618 which mesh with the gear teeth 616 on the inner circumferential surface of the cylinder 614. It will be noted that the outer diameter of the cylinder defined by the gear teeth 618 is about one half of the inner diameter defined by the

gear teeth 616. Accordingly, a 2:1 gear ratio exists, in which the arc of rotation of the outer cylinder 614 which for given arc of rotation of a cylinder 614 rotates the rod 602 of twice that arc.

In operation, and referring to Figures 32 and 33, it will be noted that in Figure 32 the latch member 608 is oriented to pass through the gap G between the extension 134 of wall 12 and the wall 32 of the slide out room 24. As the room 24 is further retracted, the pad 622 of tab 620 contacts the wall 12, thereby pivoting the cylinder 614 in a counter clockwise direction. Pivoting of the tab 620 is transmitted to pivot latch member 608, but because of the drive ratio between the gear teeth 16 and the gear teeth 624, the latch member 608 will move through an arc twice the arc through which the tab 620 moves. Accordingly, when the room is fully retracted, the latch member 608 will be in the position illustrated in Figure 33, thereby compressing the resilient tip 610 against the portion 134 of wall 12, thereby effecting a seal therebetween. When the room is extended, outward movement of the room pivots the latch 608, which in turn pivots the tab 620, but through an arc only half that of the member 608, such that when the room has been extended sufficiently to cause the tip 622 of tab 620 to move away from the wall 12, the latch member 608 will be rotated to the position illustrated in 56, permitting the latter to move through the gap G without interference. Since the member 608 extends continuously from the top to the bottom of the unit, resilient seal 610 seals the sides of the slide out room against entry of moisture.

In the Claims:

1. Latching mechanism for latching a slide out room to a main living area of a mobile living quarters when the slide out room is retracted into the main living area comprising a latch responsive to relative movement of the slide out room relative to the main living area for securing the slide out room to the main living area when the slide out room is retracted into the main living area and for releasing the slide out room when the latter is moved away from the retracted position.

2. Latching mechanism as claimed in claim 1, wherein an actuator is responsive to relative movement of the slide out room relative to the main living area, and a driving link interconnects the actuator and the latch whereby said actuator causes said latch to latch the slide out room to the main living area when the slide out room is retracted into the main living area and to disengage said latch when the slide out room is extended from the main living area.

3. Latching mechanism as claimed in claim 2, wherein said latch is moved by said actuator through an amplifying link such that the latch moves a greater amount than the actuator moves.

4. Latching mechanism as claimed in claim 1, wherein said latch is operated by an electrical actuator.

5. Latching mechanism as claimed in claim 1, wherein said latch includes a detent mechanism for releasably locking said latching mechanism in both engaged and disengaged positions, said detent mechanism including means responsive to a smaller force to move the latch into the engaged position and a larger force to move the latch from the engaged to the disengaged position.

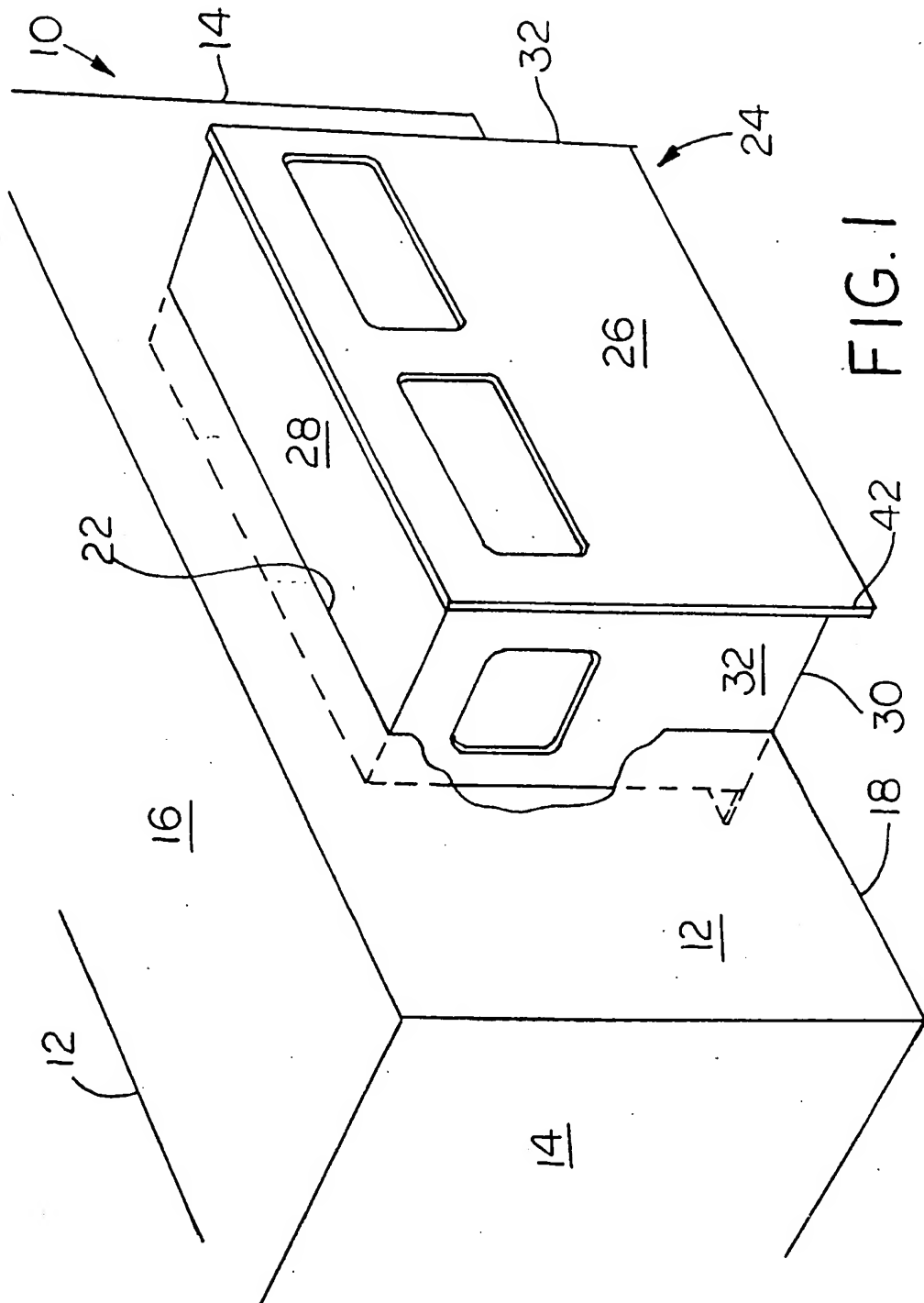
6. Latching mechanism as claimed in 5, wherein said detent mechanism carries said latching mechanism to pull said slide out room to the fully retracted position.

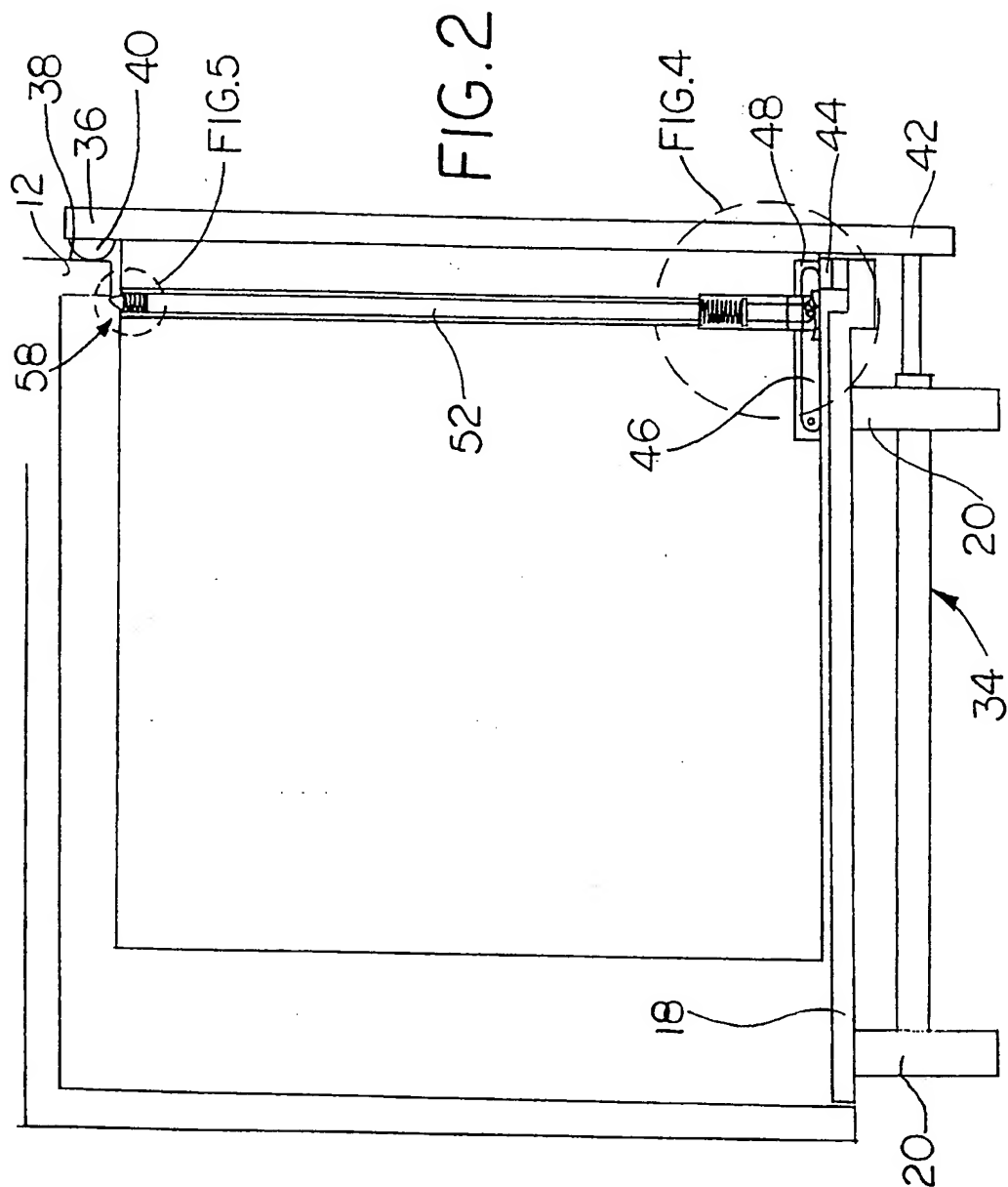
7. Latching mechanism as claimed in claim 1, wherein said latching mechanism includes an actuator mounted on said slide out room displaced from said latch toward said portion of said slide out room engaged by said drive means, said actuator being responsive to movement of said slide out room to operate said latch, and a driving link extending between the actuator and the latch.

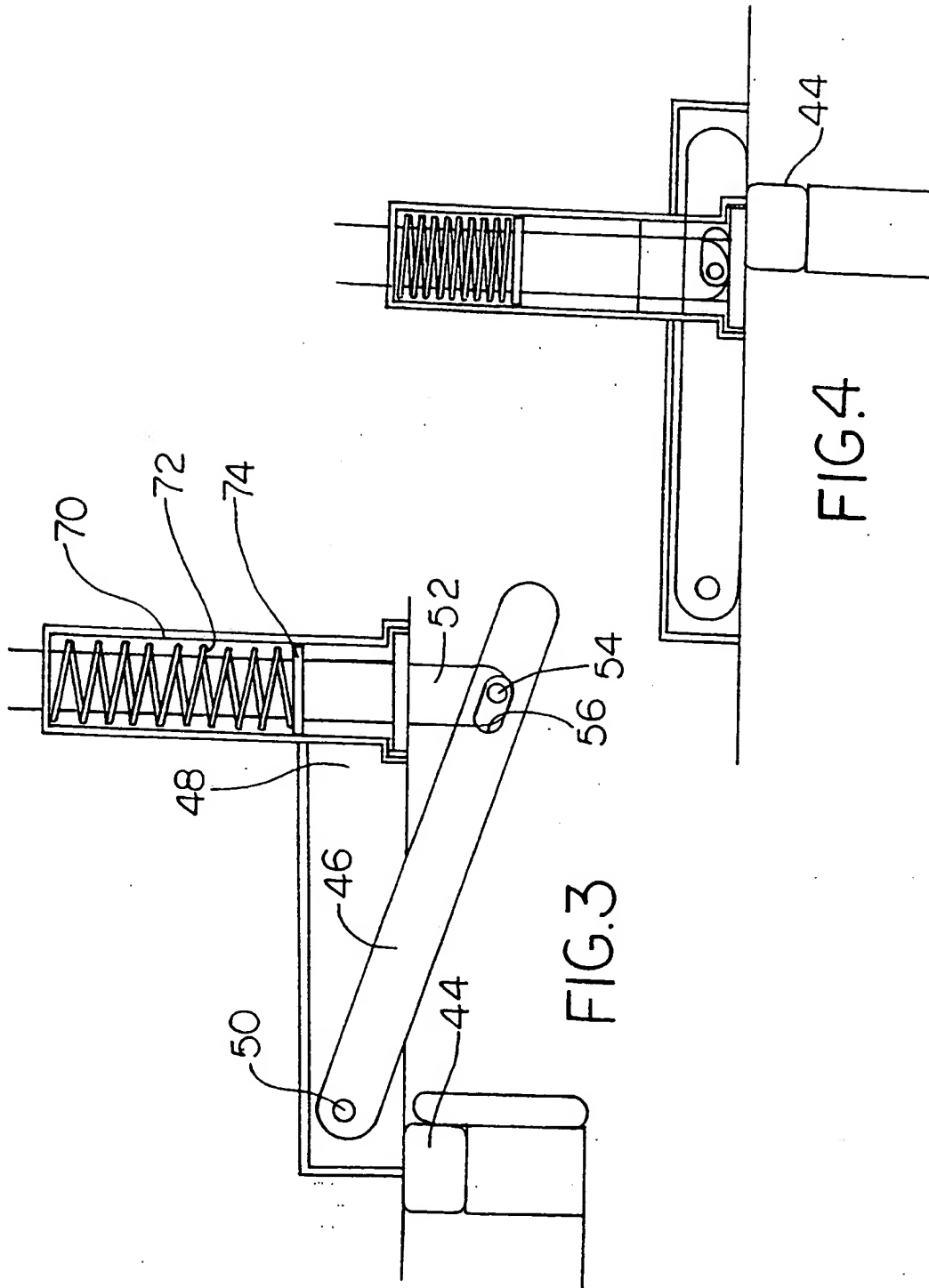
8. Latching mechanism as claimed in any of claims 1, 2, 3, 5, 6 or 7, wherein said latch is a lever pivotally mounted on slide out room

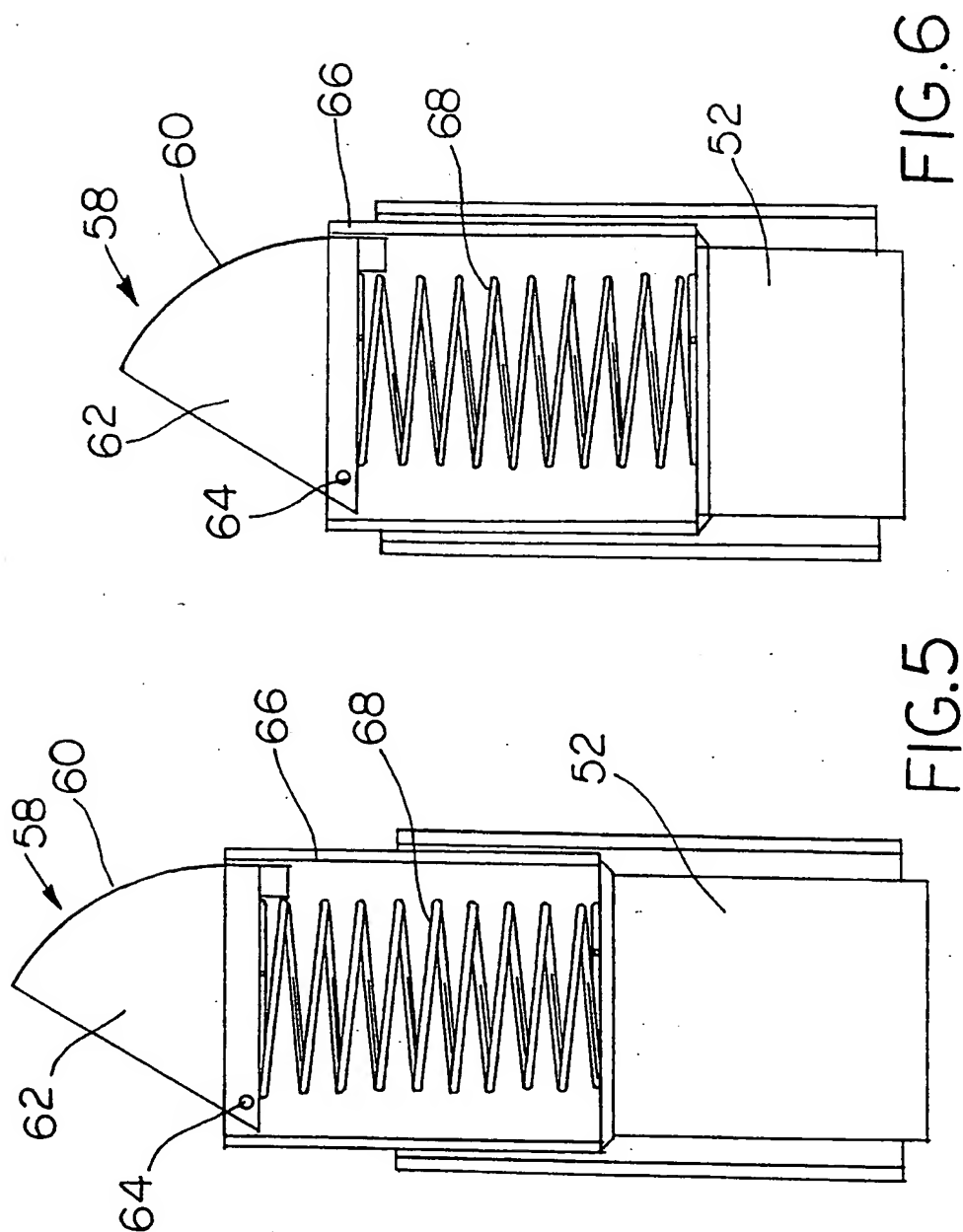
9. Latching mechanism as claimed in claim 8, wherein said actuator is movably mounted on said slide out room and engages said main living area as the slide out room is moved into said retracted position.

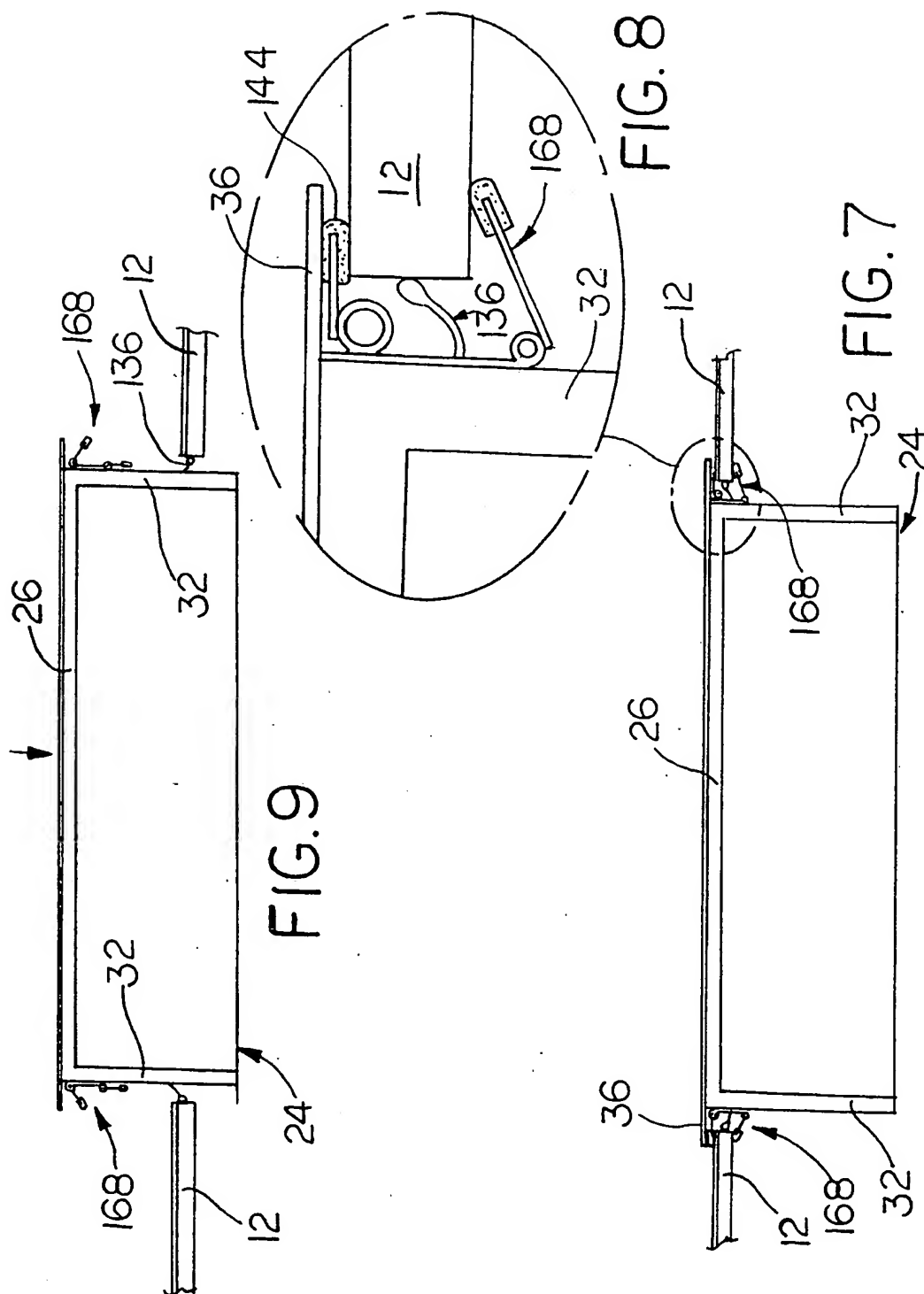
10. Latching mechanism as claimed in claim 7, wherein said actuator includes a tab pivotally mounted on said slide out room, said tab being pivoted by engagement with the main living area as said slide out room is moved into the retracted position, said latch being pivotally mounted on the slide out room, and a gear drive drivingly interconnecting the tab with the latch for differential movement of the latch and the tab relative to one another.

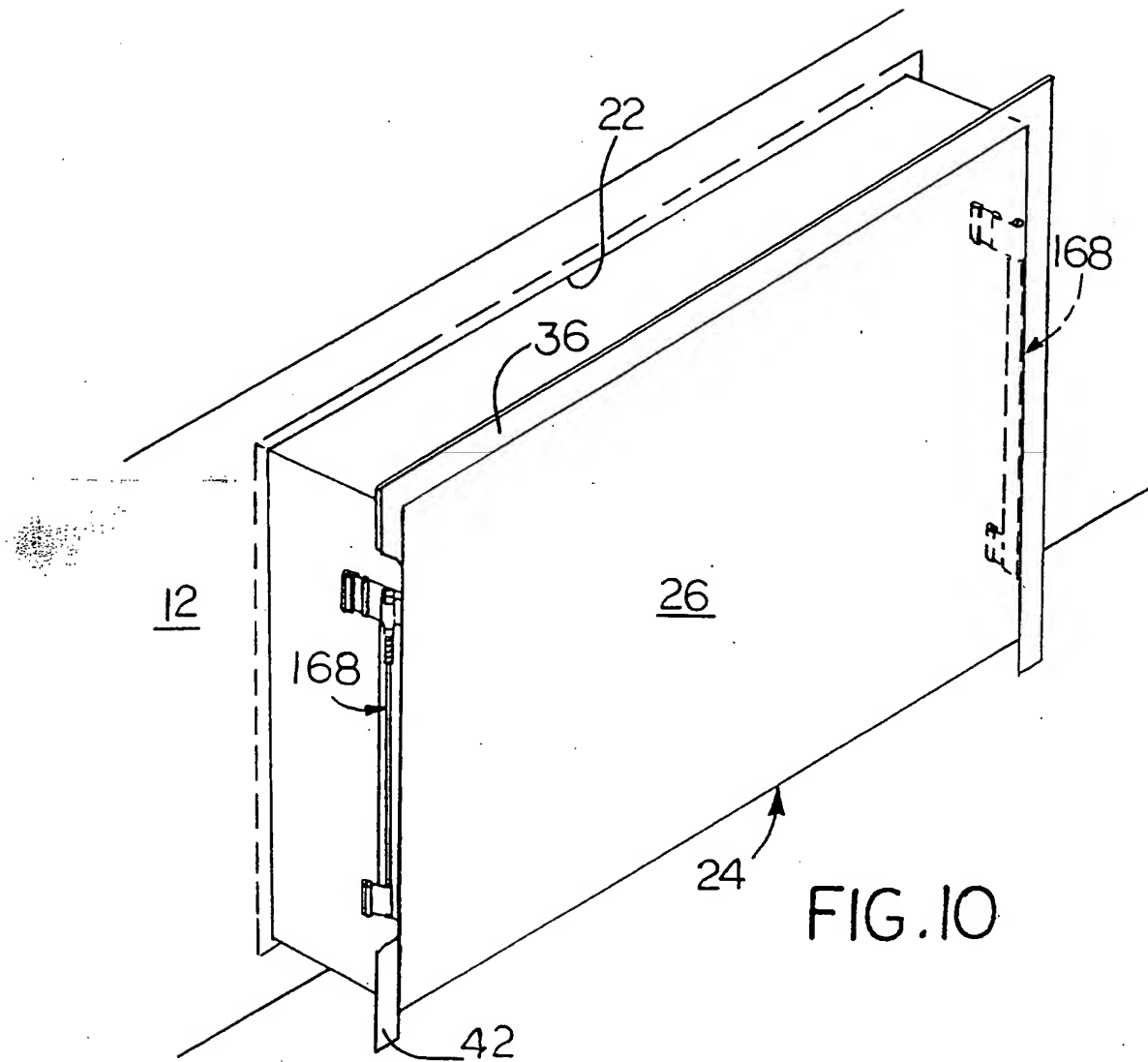


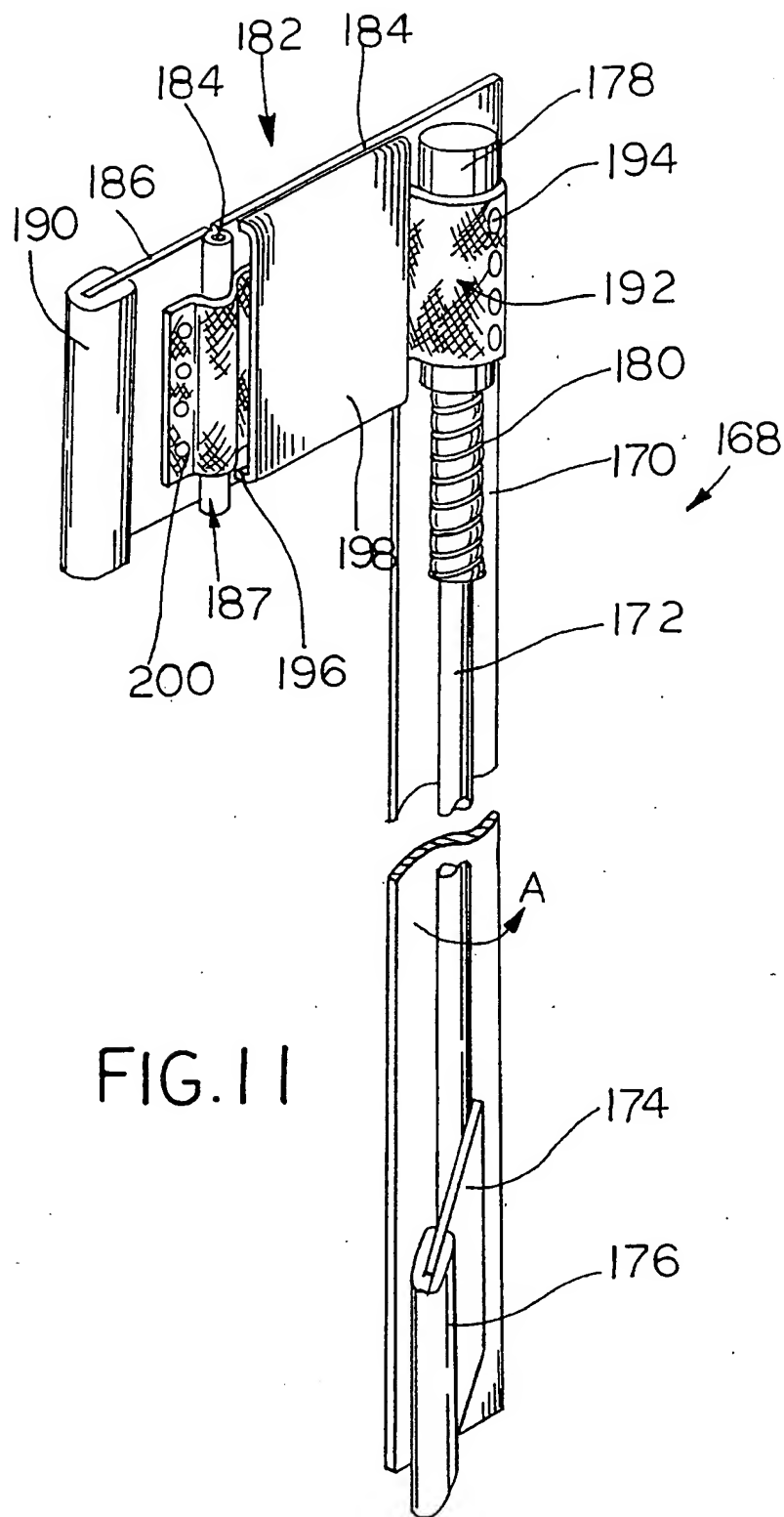


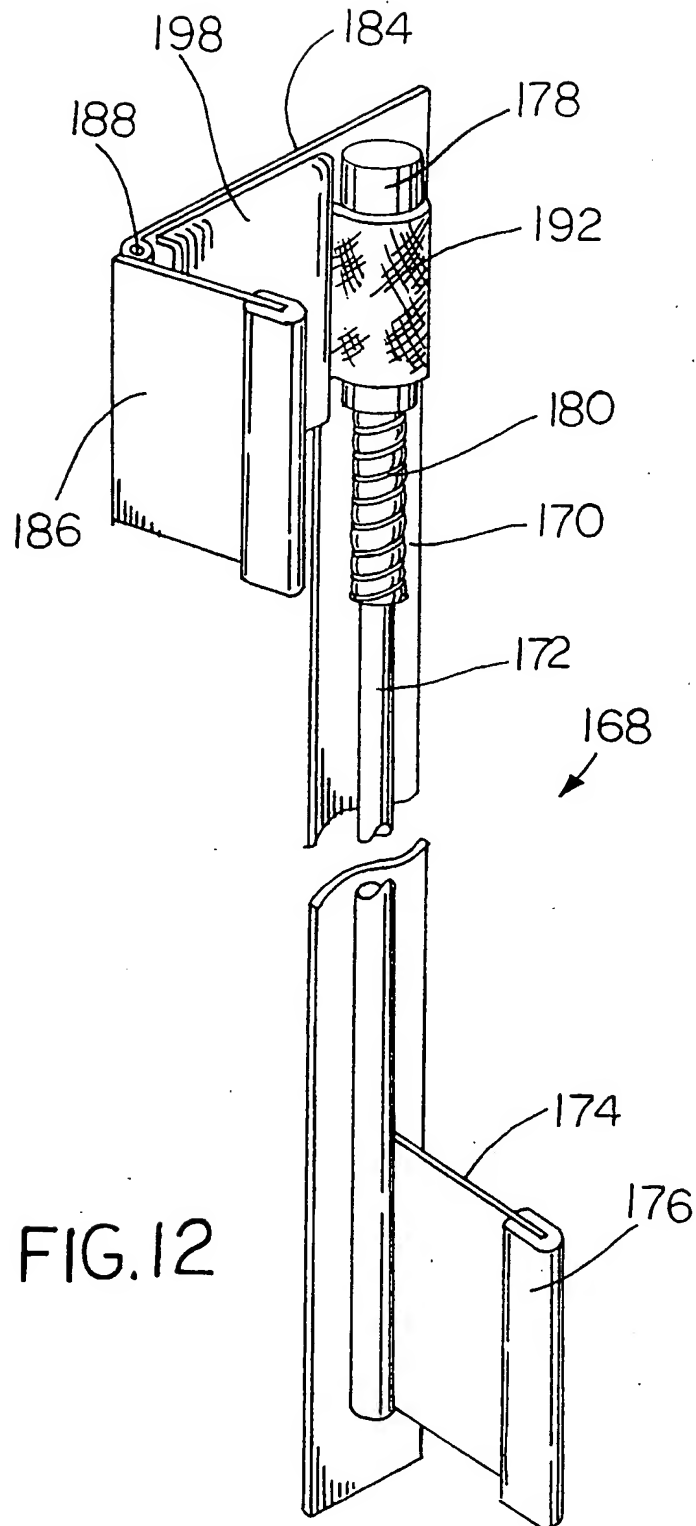












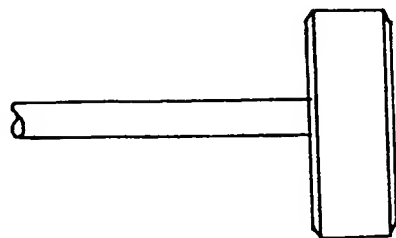
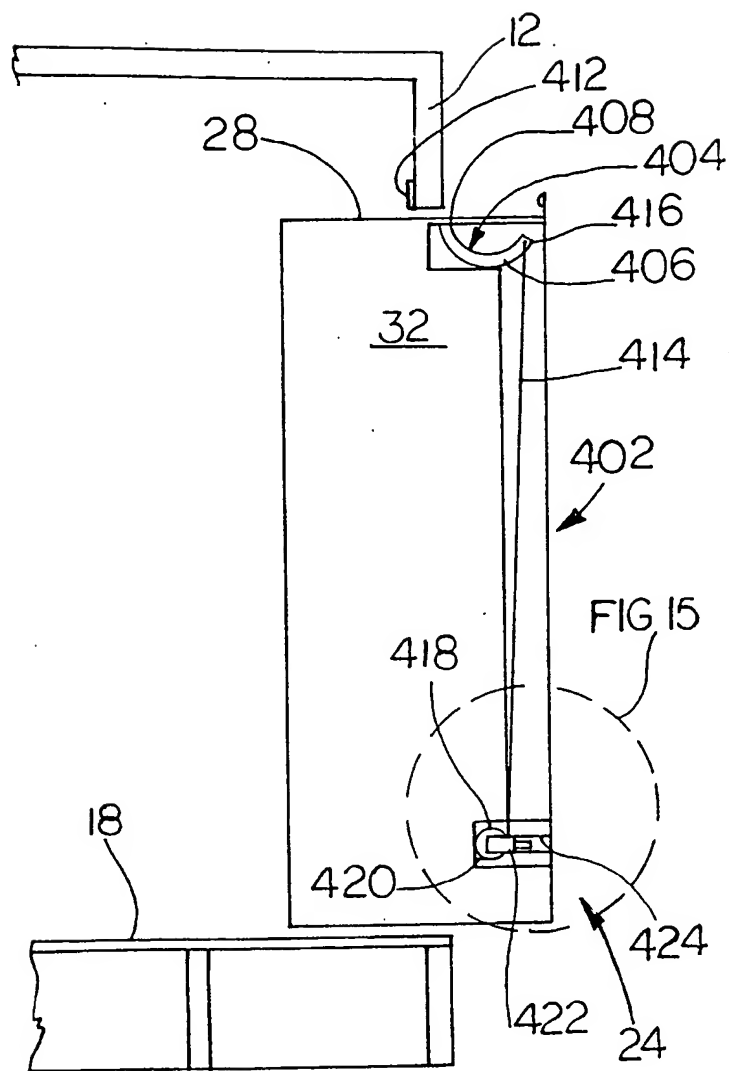
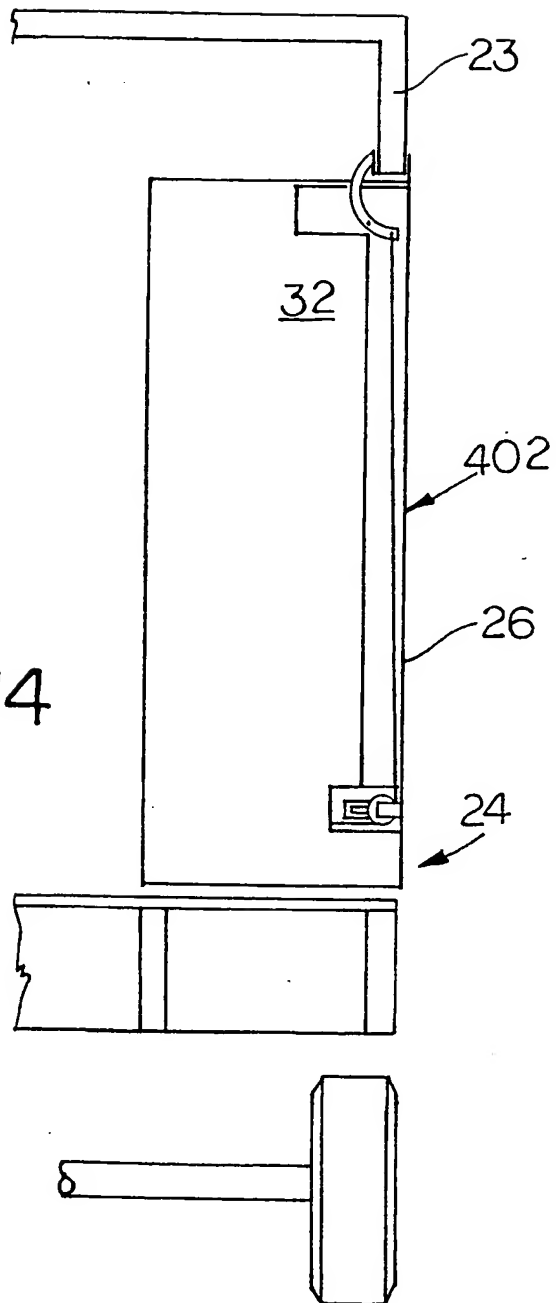


FIG 14



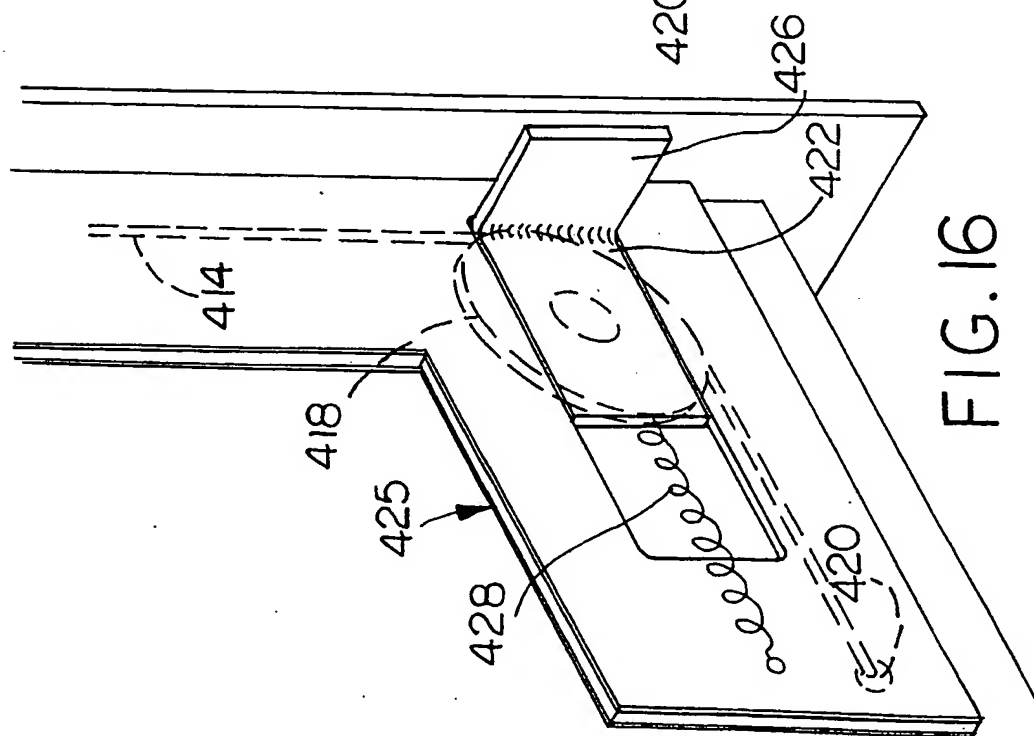
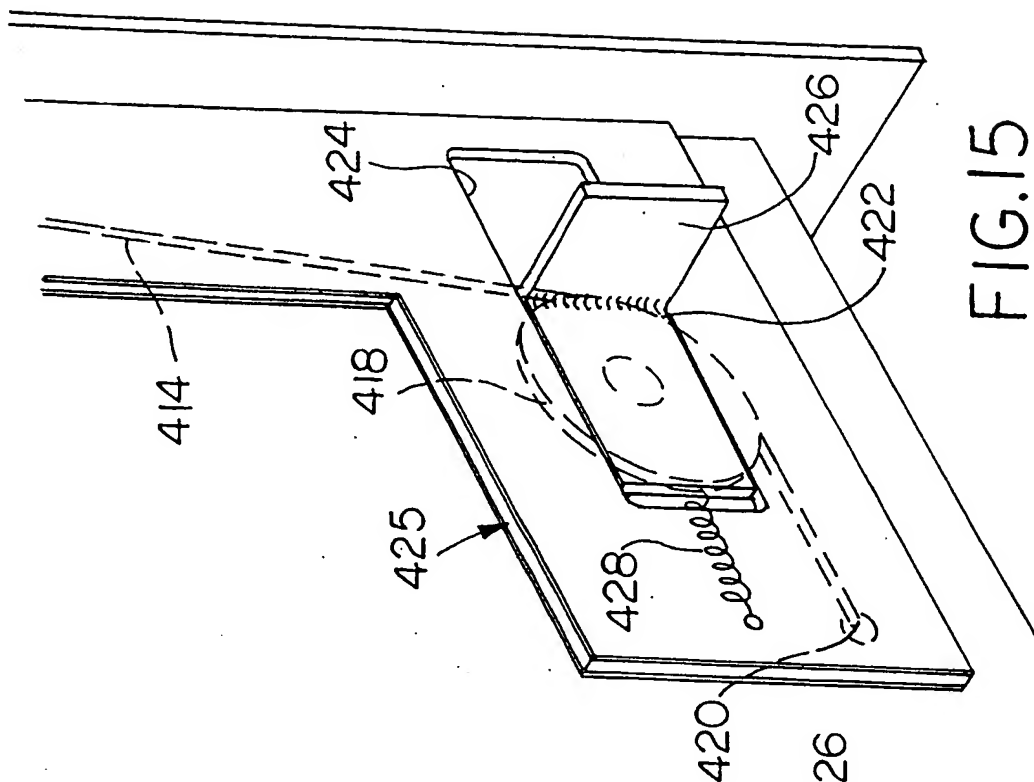
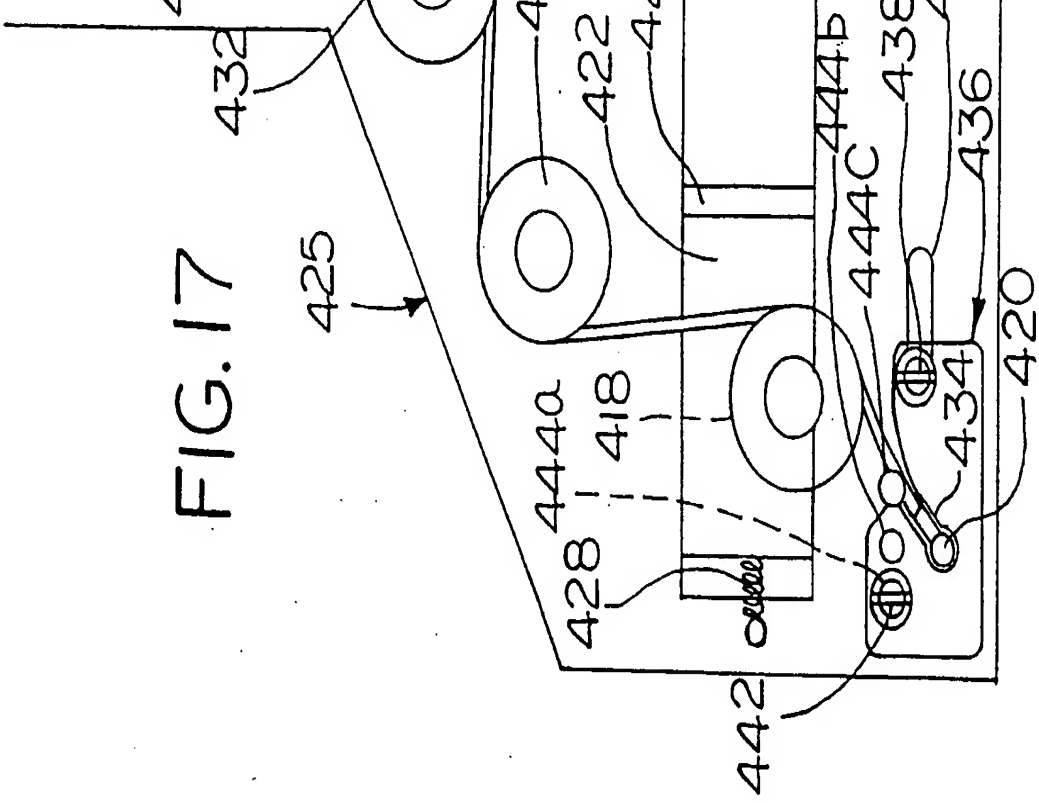
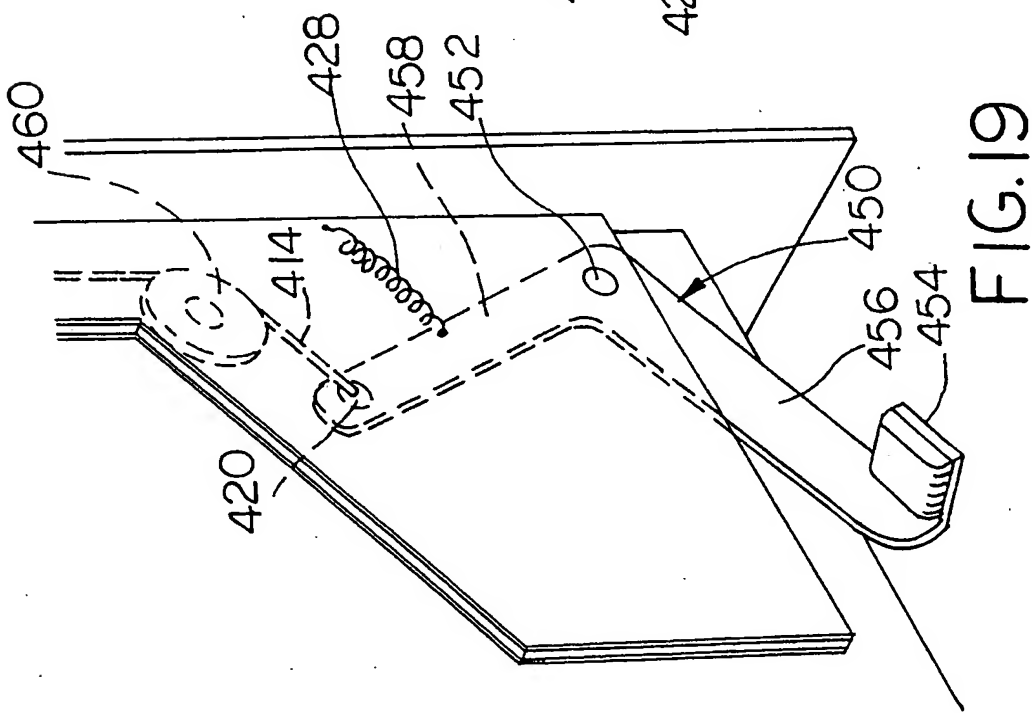
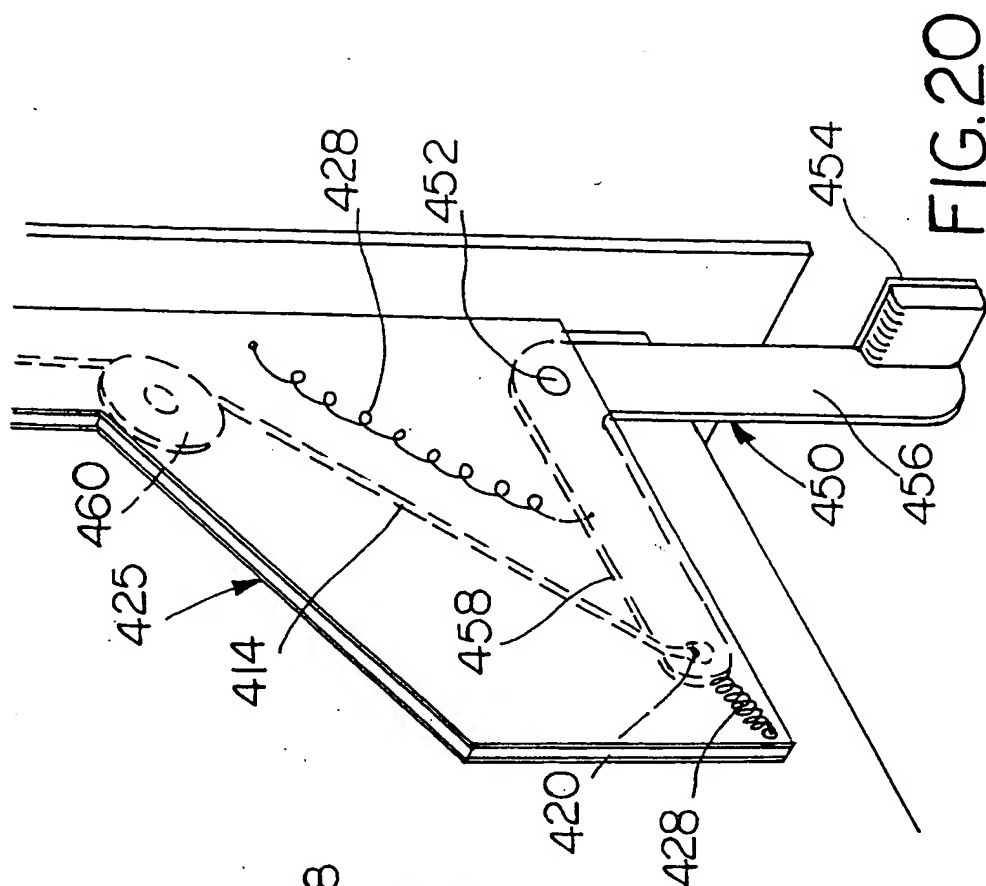
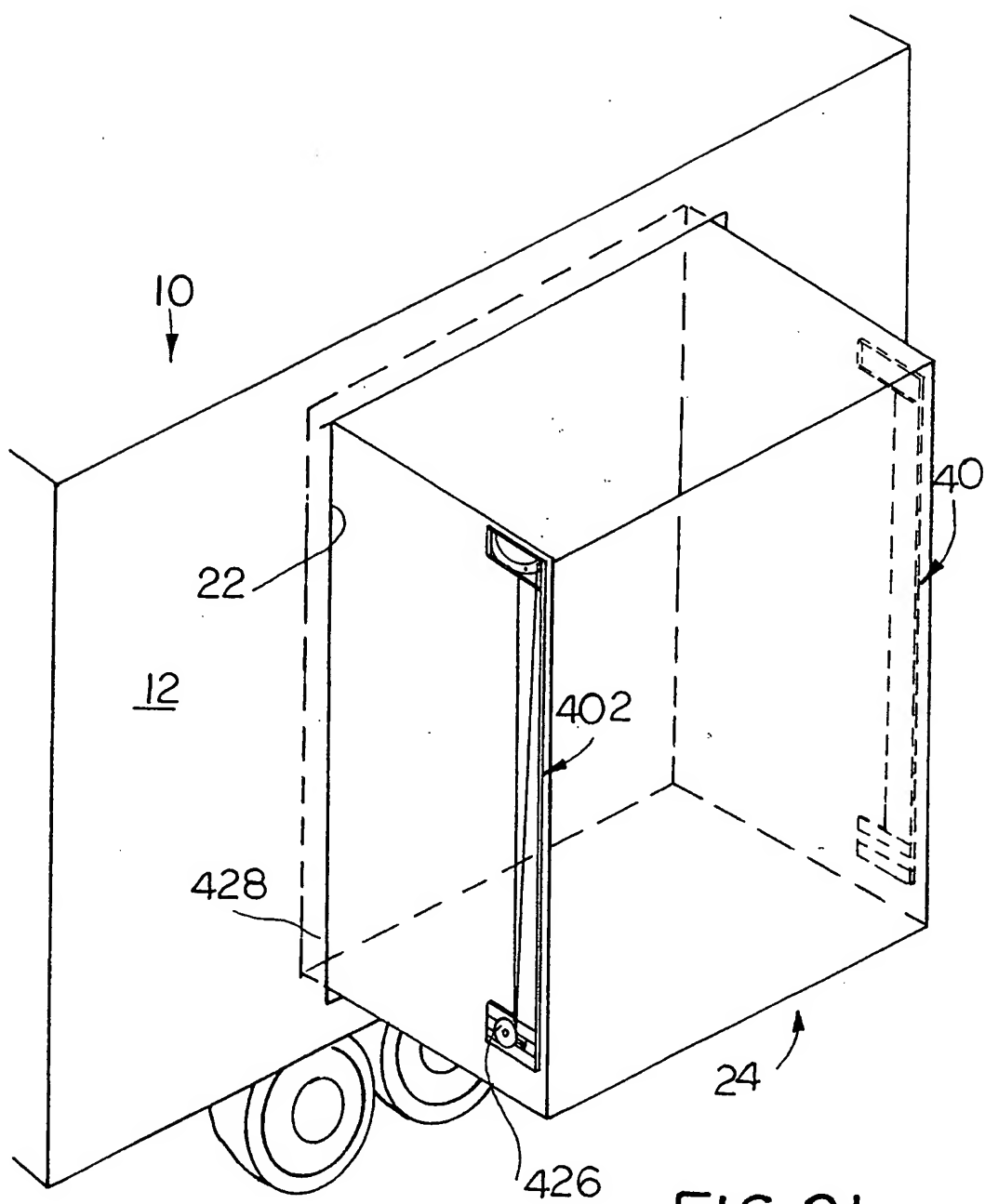


FIG. 17







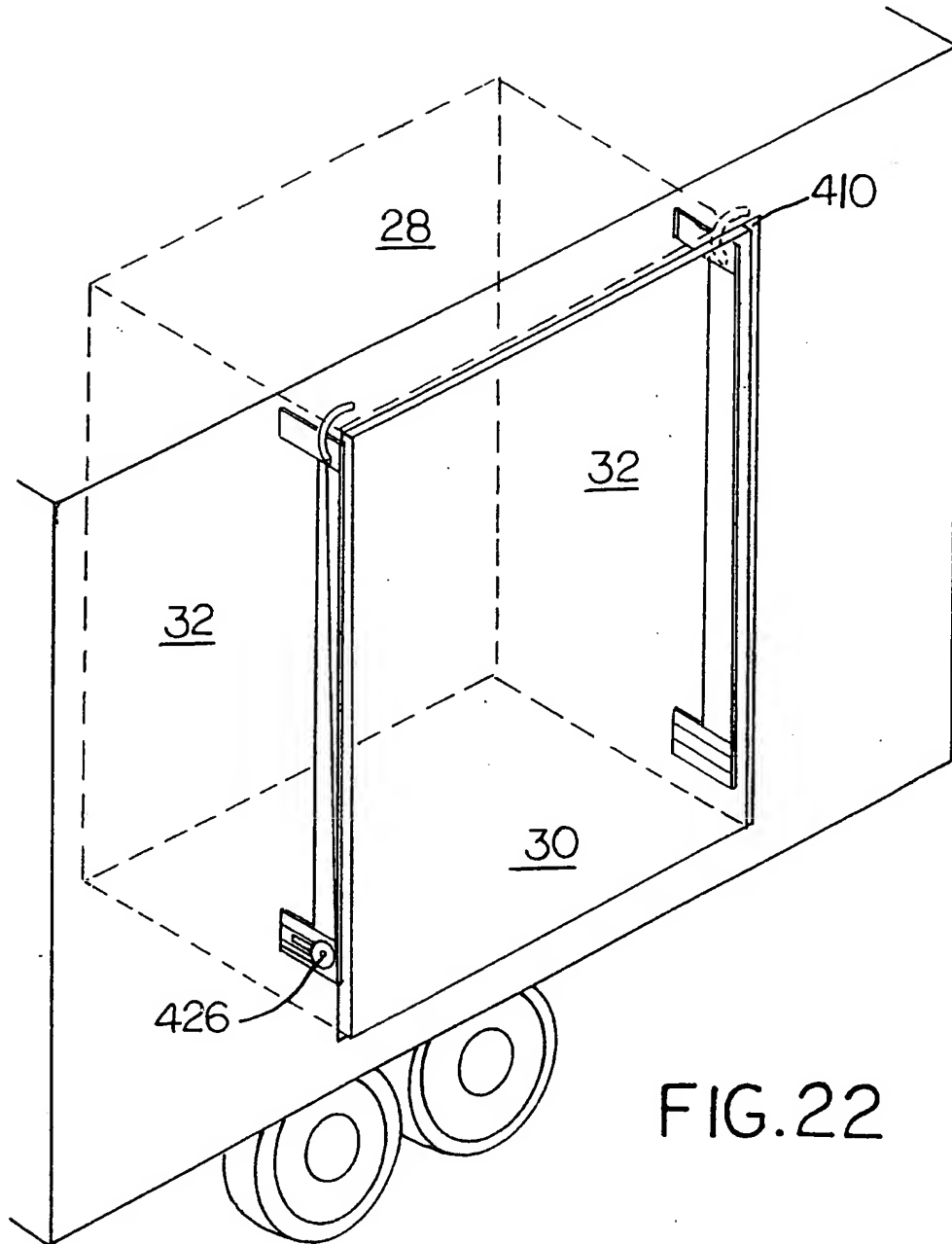
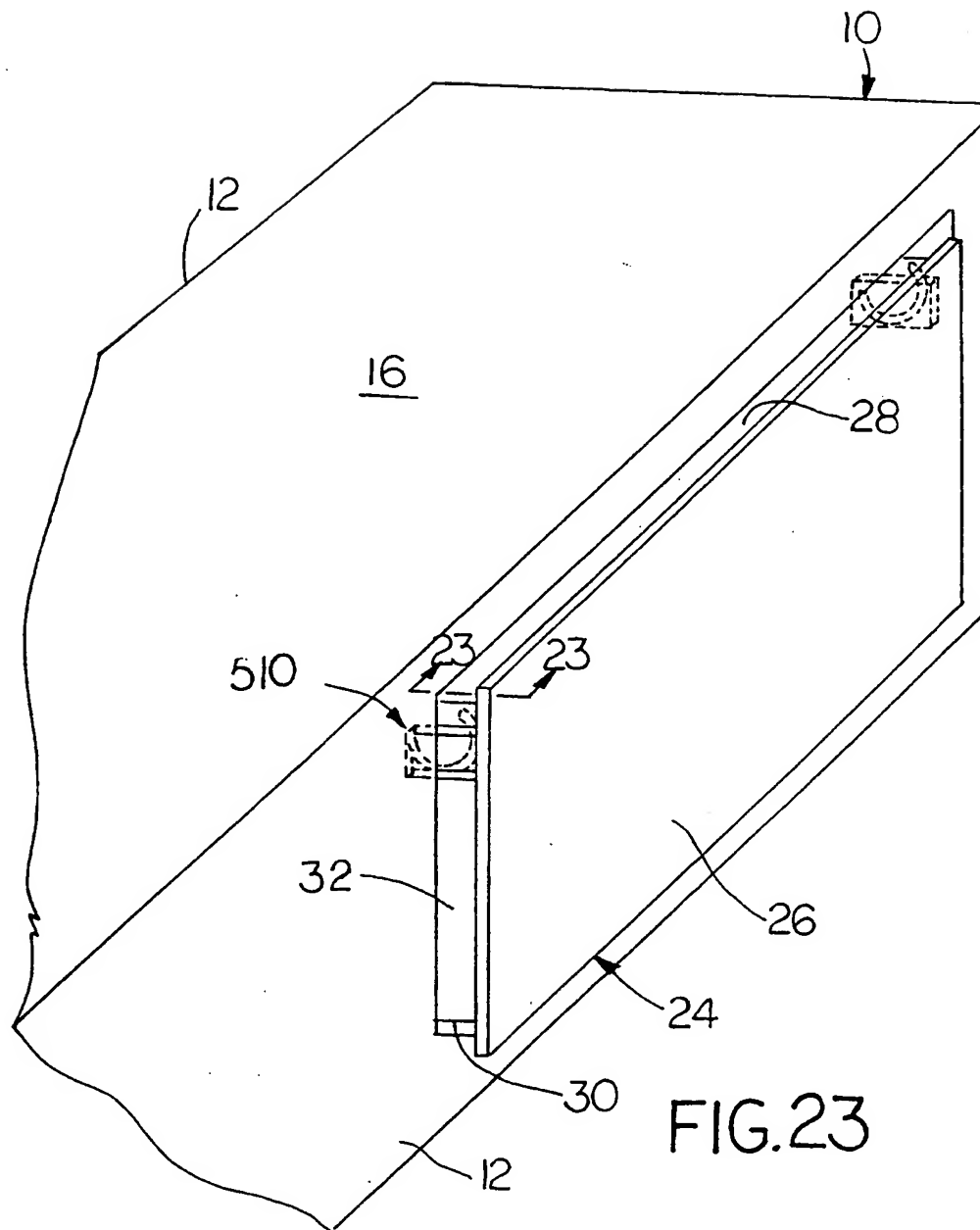


FIG. 22



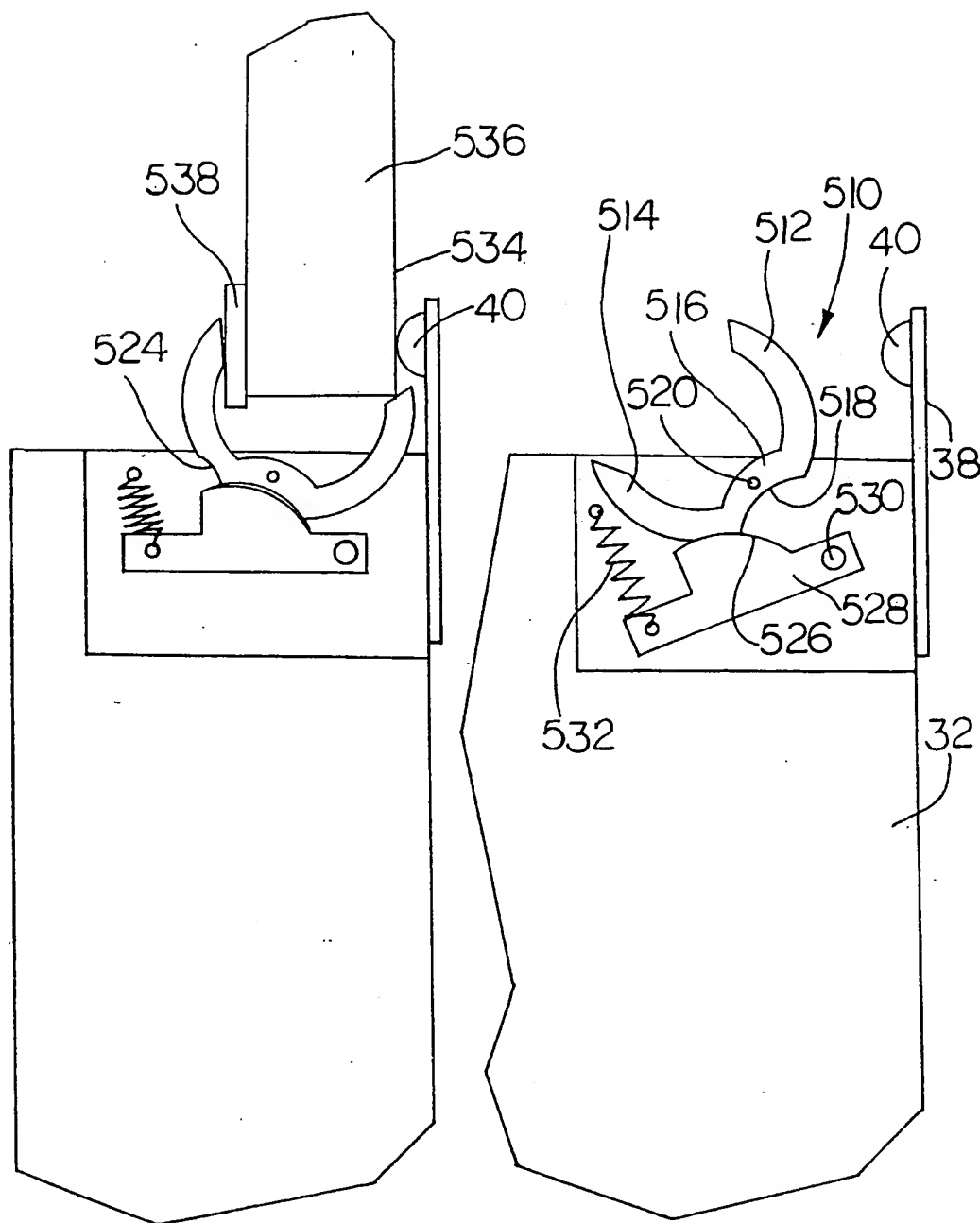
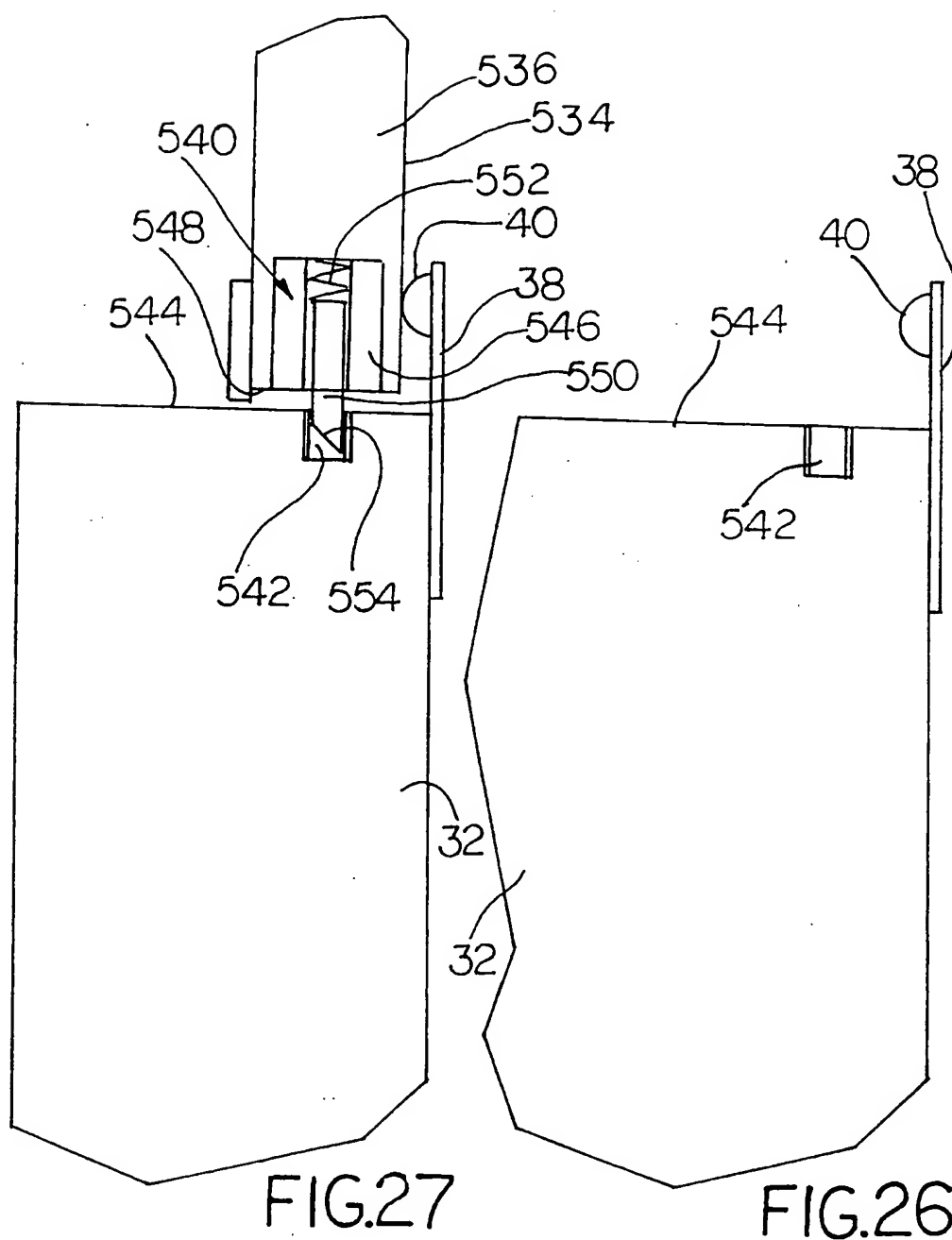
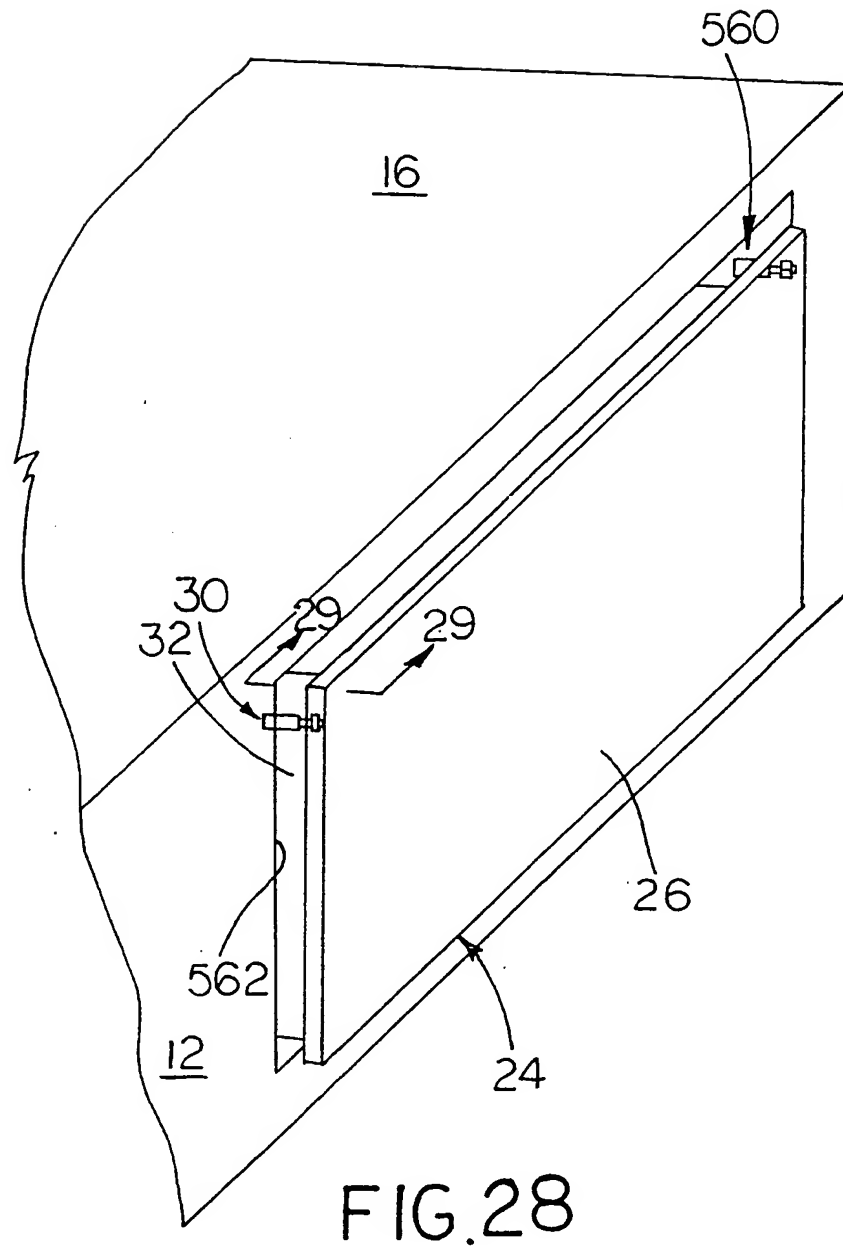
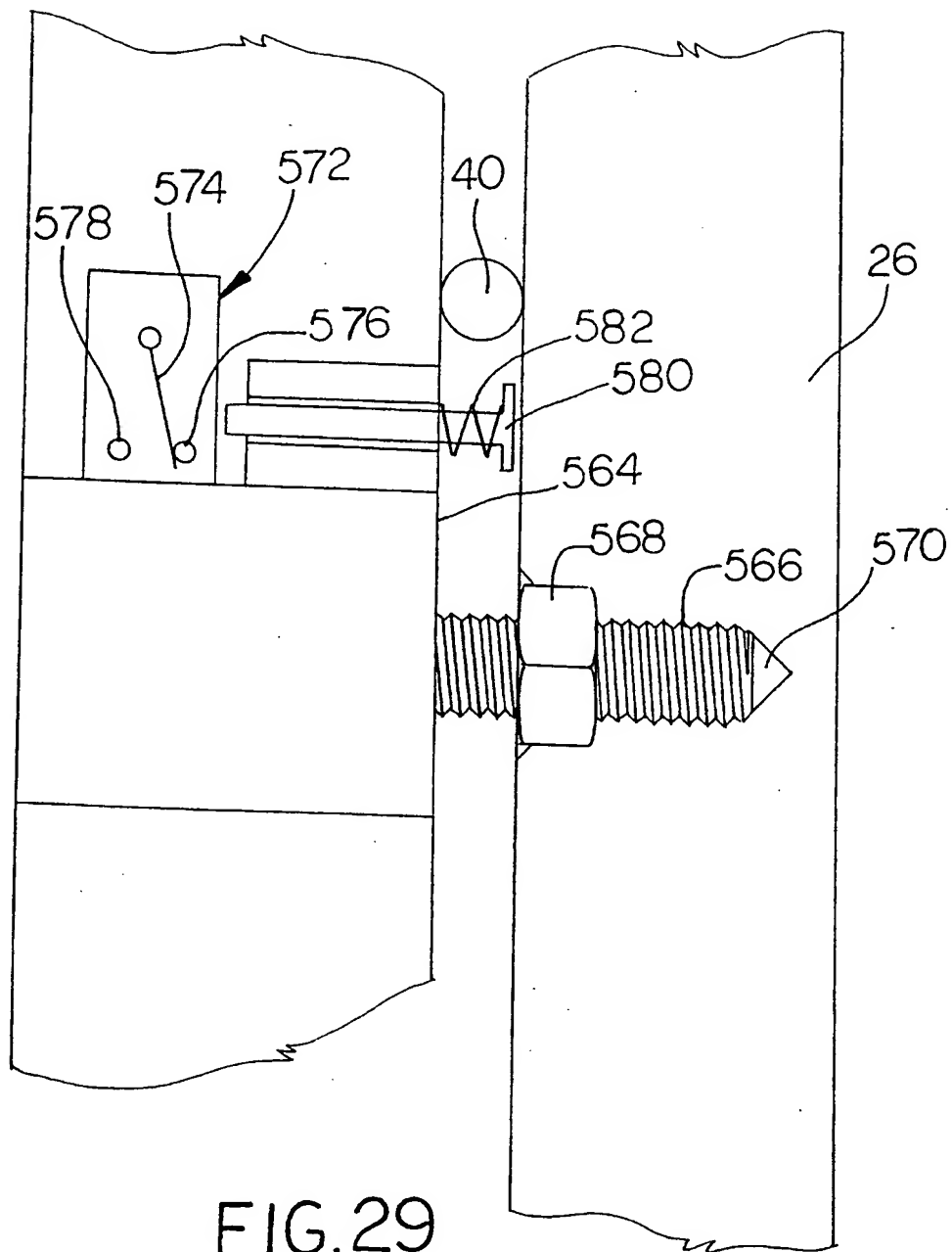


FIG.25

FIG.24







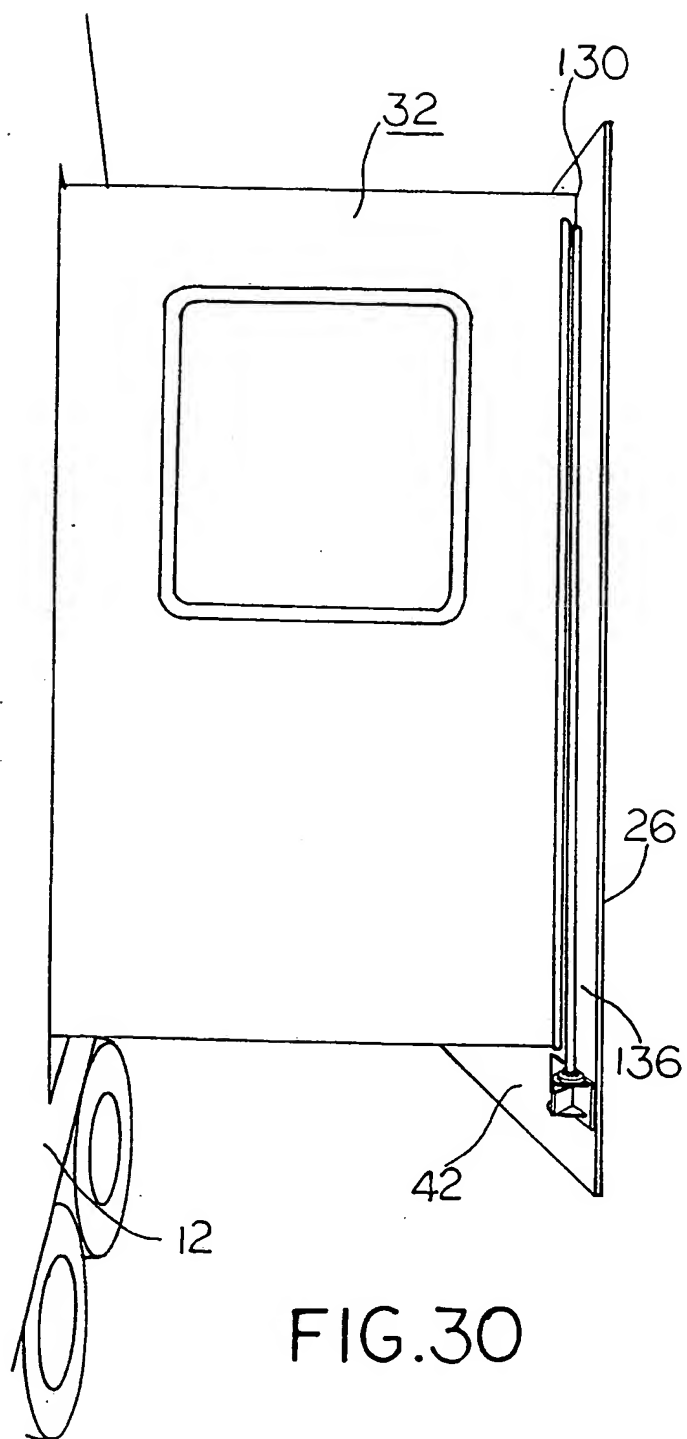
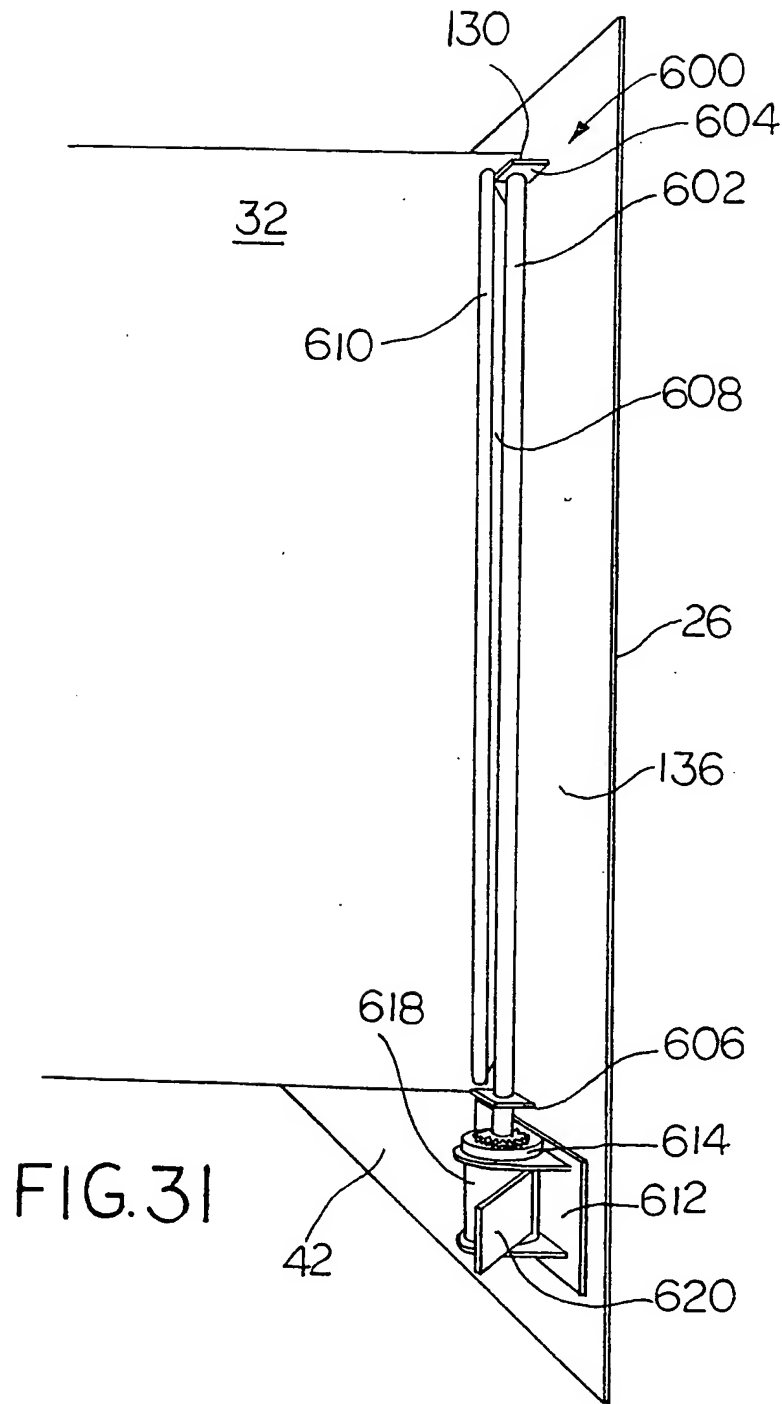
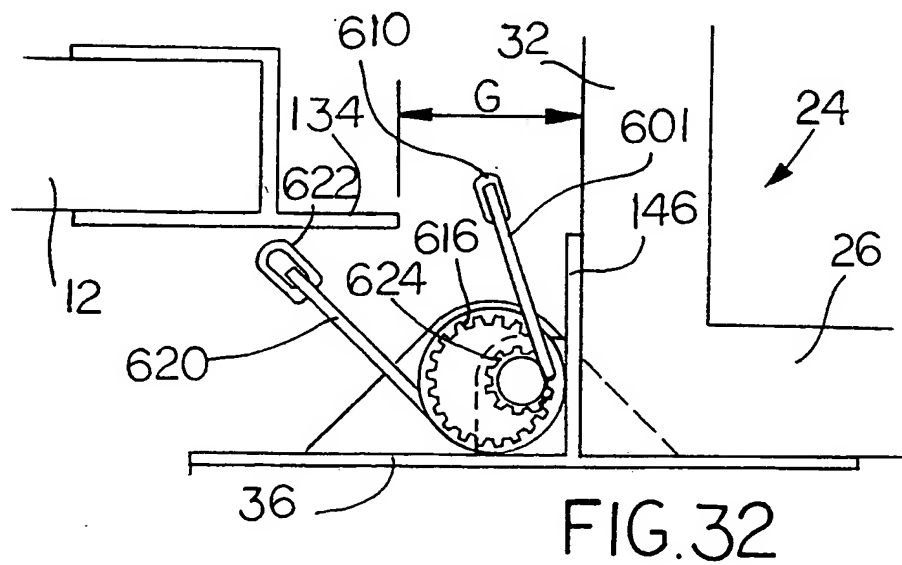
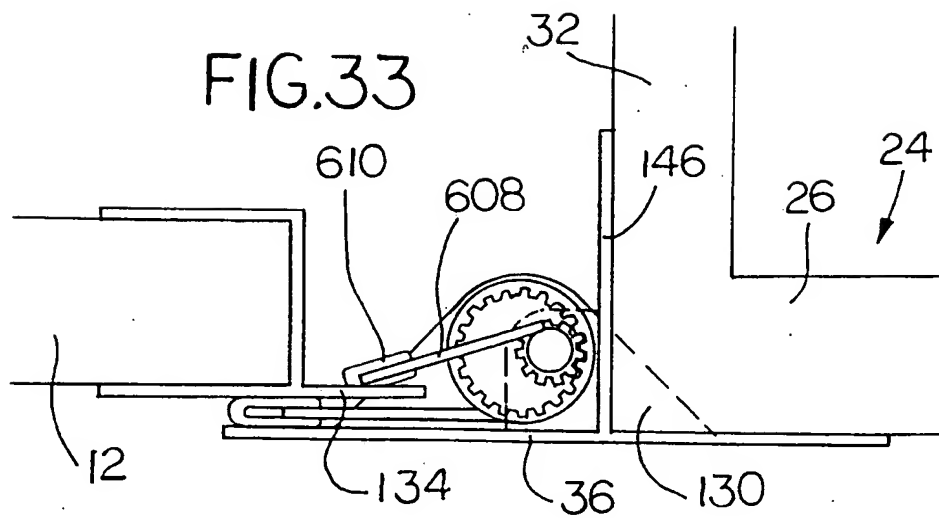


FIG. 30





INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/27252

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B60P3/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B60P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 360 444 A (RIOUT) 3 March 1978 see page 5, line 5 - line 38; claims 1-8; figures 1-7 see page 3, line 12 - line 26 ----	1,2,7,8
A	US 5 560 444 A (TIEDGE) 1 October 1996 see column 1, line 42 - column 2, line 18 see column 2, line 53 - column 3, line 60; figures 5-12 ----	1
A	US 4 049 310 A (YODER) 20 September 1977 see column 4, line 1 - line 19; figures 2,9,10 -----	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

16 April 1999

Date of mailing of the international search report

23/04/1999

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/27252

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2360444 A	03-03-1978	NONE	
US 5560444 A	01-10-1996	NONE	
US 4049310 A	20-09-1977	NONE	

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